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Established 1914

CHEMICAL INDUSTRIES

Vol. 40 :Mar. 1937 No. 3

Published monthly and entered as 2d class matter Dec. 22, 1934, at the Post Office at New Haven, Conn., under the Act of March 3, 1879. Subscription, domestic and Canada, $3 a year; foreign, $4.

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It's PRECIOUS LIQUOR *to Jim Lester*

•

THERE'S more to Jim Lester's job in Mathieson's plant at Saltville, Virginia, than just filling liquid caustic tank cars. His is the task not only to see that cars are properly filled, but to make sure that each car interior is clean and free from defects before filling, that pipe lines, valves, pumps are all in perfect condition. On him rests a goodly share of the responsibility for the uniform purity of Mathieson Liquid Caustic when it arrives at your plant.

One reason Jim Lester carries this responsibility so well is his frank respect for the quality of Mathieson Caustic. Throughout the eleven years he has worked at Saltville, this man has watched his company steadily improve its processes, has seen it lead time and again in producing caustic which set new standards for purity and uniformity. With such a background, it is no wonder Jim Lester regards the product in his care as "precious liquor"—no wonder that, like all of the men behind Mathieson Chemicals, he spares no pains to deliver you a dependable product of uniform, outstanding purity.

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60 East 42nd Street New York, N. Y.

Send for free 72-page book, "Cutting Costs with Liquid Caustic Soda."

Mathieson Chemicals

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The Reader Writes:—

Better Patents: Less Trouble

Accept my congratulations on the editorial on the "United States Patent System" which appears at page 127 of your February, 1937, number. Some of the proposals recently made for the improvement of the patent system have considerable merit, but in the main they appear to me to be an attempt to substitute legislation for moral fiber. As the editorial states, if we had better patents, we would have less patent trouble.

So long as young assistant examiners draw $1,800 to $2,600 per annum in the Office and can leave uniformly for industrial or professional positions at $4,000 or more, just so long will we be having some difficulty with the type of patents issued in the Office.

Our judicial system, good or bad as one may think it is, *does* involve the use of trained men. Our judges are drawn from panels of lawyers, and no man is likely to be appointed a judge until after he has had many years of experience in the practice of law. In the case of patent examiners the contrary is true; that is, the "judges," i.e., the assistant examiners, who make the decisions in most cases, are the most unskilled of the whole lot of men who are concerned with patents.

Chicago, Ill. BRUCE K. BROWN.

One Among a Hundred Letters

Orchids to you for your very pertinent editorial "Scientific Censorship" on page three forty-eight of your October issue.

That we as a profession should allow such a condition to obtain is not a very glowing tribute to our professional consciousness, and I can assure you that I was not very proud of my membership in the American Chemical Society when this incident occurred.

That we allow ourselves to be so subjugated by another profession is entirely our own fault, but if one can't look to one's professional society to uphold his professional standing I am sure I don't know where he can look. However, it is most refreshing and certainly gratifying to find that a trade paper would still go to bat for us, and I would suggest that you send a copy of this editorial to *Time* magazine which has run a number of comments on this controversy.

Grand Rapids, Mich. ELMER F. WAY.

Thanks—Thanks

Your letter advising that you will send a duplicate copy of the CHEMICAL GUIDE-BOOK to replace the one we lost in the flood sounds like pennies from heaven. Everyone else seems to delight in plucking all our tail-feathers now that we are drying out. The book you sent us is here. Thanks, thanks. It means plenty to us. We can't get along without it.

Cincinnati, O. G. C. DOM.

"Forgotten"

No reason why I should be so proud of it, for I am just one of hundreds of thousands of unimportant white-collar American citizens, the kind of chap the newspaper editorials and the Fourth of July orations call the back-bone of the country. I used to get a real thrill when the President spoke to The Forgotten Man. I am kept busy on my own job and I have my own troubles to worry about. I don't get excited about high taxes I suppose because I only pay a very few direct taxes—gasoline, tobacco, a little real estate tax, a little income tax, the last two just enough to keep me from taking my family away to the seashore for two weeks' vacation. I never applied for relief, but I don't look down upon men who have had to do so, nor begrudge them relief they have needed. I don't blame the farmers and the labor unions for trying to get theirs through political influence. I know the department manager who is my immediate boss is a real human being, and I believe he earns most of his handsome salary which I read published in the newspapers.

What I am trying to make clear is that I am an average American and I don't become excited about the things that either the soap-box radicals or the conservative newspapers tell me I ought to get out and fight for or against as the case may be.

There are two things that do heat me up. One is the rising cost of living, which I think the government is largely responsible for in its AAA and other restriction policies; its support of labor unions which are certainly raising the cost of manufactured goods; its taxes. In fact most of its economic reforms seem to be at my expense.

The other subject that rouses me is the packing of the Supreme Court. I have just sense enough to know that judges independent of political influence are my only means of protection against the Government, the capitalists, and the communist—all of which groups I figure are against my small interests.

Pittsburgh, Pa. JOHN M. THRALL.

Outlawing Reciprocity Selling

I see by the papers that Representative Patman has introduced a bill amending the Clayton Act to include reciprocity selling among the unfair trade practices banned by this law. I have read your editorials on this subject, and letters from your readers denouncing "reciprocity." It is completely bad selling, bad for the consumer, bad for the supplier, bad for the salesman, and bad for the purchasing agent. It is even bad for the credit manager and I am not sure that it isn't bad for the shipping clerk.

It is getting to be a dangerous evil in the chemical industry where the big companies certainly resort to the use of this underhand leverage to an astonishing degree. I wouldn't be at all surprised if some of them attached to their sealed government bids a little memorandum telling Uncle Sam how many three-cent postage stamps they bought last month. I suspect that some sales managers would even refuse to patronize the barber or the bootblack whose shaving soap and shoe polish weren't made from the right brands of alkali or solvent. I know too well, from first hand experience, that no one can sell a box of paper clips or a Stilson wrench to some chemical companies without being a victim of this racketeering selling.

Assuming that the amendment proposed by Representative Patman passes, I cannot see how it can become anything but another dead-letter law. It cannot be enforced and it will not be enforced for the same reason that the Prohibition Laws broke down. We object to buying from a reciprocity seller because it deprives us of independence in our purchases, but we do not really blame him for using this very effective sales argument. We may believe that reciprocity is bad practice for the good of the entire industry; but even those who feel that it is an unfair trade practice, do not think the seller morally wrong for using this argument. Although I hate reciprocity and believe it is wrong, nevertheless I hope that this amendment will not pass and so add another unenforceable law, breeding disrespect for all law in this country.

Boston, Mass. LYON WATKINS.

CHEMICAL INDUSTRIES

The Chemical Business Magazine

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Insuring the Future

Two important chemical companies—there may be others who do likewise—have been vitalizing their research by the simple expedient of a regular, favorable contact with the other departments of the business. The plan is simple indeed, and like many direct methods, it has accomplished results far beyond expectations. Monthly the research director meets with the other chief executives of the company.

There are minor differences in the personnel of these two committees, but it is significant that in both instances the president himself and an outside technical consultant are members. In both instances there is representation of the production, sales, and financial sectors of the organization. One of these committees is composed of but six men, the president, treasurer, the vice presidents in charge of manufacturing and of selling, the research chief, and the consultant. The other committee, embracing several plant and sales managers, is considerably larger. From both committees comes enthusiastic endorsement of the idea, and we gather that the size of the committee is of minor importance compared with its objectives.

Basically this is not an original notion, but in two important respects these objectives are new. Essentially these committees meet to insure the future of the company. From the long-range point of view they discuss everything and decide nothing. Today's troubles are not brought to these meetings and present problems are only considered as guides to the future. Thus these committees avoid the minutia of departmental administration and keep their attention focused on the task of cooperative planning. The profitable results appear first in the pointing up of the research program to definite workaday ends, and second in the wholehearted support of the research director by his fellow executives. These are two worthy causes, well worth working for, often needing encouragement; and since the industry spends something like twenty-five millions a year in research, rather important from the balance sheet point of view.

The Outside Point of View

Disinterestedness is one prime requisite of sound judgment. Hence the wise lawyer will not serve as his own attorney: the experienced physician will not treat his own sick child.

The larger the organization and the more technical its problems, the more important courageous, independent thinking becomes. Disinterestedness, however, is just about the rarest attribute that any manager can find in his own men.

Five subjects that come up periodically in any chemical concern demand this quality of disinterestedness to a high degree. Research programs, new process testing, new product development, patent applications, and advertising campaigns—these all need the outside point of view for intelligent debate and correct action.

The above is a paraphrase of a letter from a leading technical executive. He begs us write an editorial praising the honest, competent, outside consultant and emphasizing the value of his services to a chemical company. The facts are so plain and pertinent that, if they are but pointed out, our readers can pen their own moral.

Reflections on Rayon

Rayon production statistics published February 13 in the London *Economist* differ but slightly from figures compiled in this country and they are in a most convenient form from which to make illuminating comparisons:

World Production of Rayon

(In thousands of lbs.)

Country	1930	1931	1932	1933	1934	1935	1936*
Japan	33,330	46,750	64,395	97,800	155,300	220,000	285,000
U. S. A.	115,000	140,800	131,085	208,000	210,300	257,500	278,000
Britain	48,870	54,570	72,510	86,835	92,855	111,800	113,000
Germany	57,880	55,000	64,680	65,000	90,000	104,000	112,000
Italy	59,700	76,120	70,145	70,900	84,700	86,000	88,000
France	39,160	36,365	47,255	57,200	58,000	53,000	42,500
Netherlands	15,840	19,800	19,405	19,250	20,500	20,000	20,000
Russia	1,320	3,525	5,725	8,600	12,000	12,500	14,000
Canada	4,840	5,565	7,120	7,610	9,250	12,750	12,000
Poland	6,000	8,000	7,400	7,920	9,650	11,260	11,300
Belgium	10,450	10,395	9,780	10,200	12,750	13,500	13,500
Other countries	17,835	13,900	19,075	22,500	28,000	28,550	29,790
Total	410,225	470,790	518,575	661,815	783,305	930,860	1,019,090
Of which:							
Viscose	357,500	420,740	454,245	569,704	687,305	816,360	888,220
Acetate	28,105	34,385	42,760	62,745	57,500	81,000	96,940
Cupra	16,040	11,880	15,465	23,207	34,600	33,350	33,690
Collodion	8,580	3,785	6,105	6,159	3,900	150	240

NOTE.—The figures for 1929-32 include staple fibre. * Provisional.

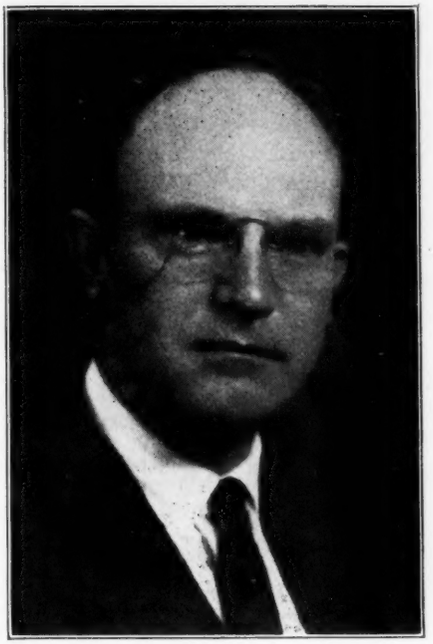
Any American will be struck immediately by the fact that our position at the head of the column has been taken by Japan. During the past year Japanese output is estimated to have increased 25 per cent. That is an astonishing growth, but it pales before their stupendous accomplishment of increasing rayon production 758 per cent. in the past seven years and during a world-wide depression. Our own record of rayon growth—7½ per cent. for the past year and 142 per cent. for the seven-year period—is one to be proud of; but the Japs have easily outstripped us.

Their triumph may not be tossed lightly aside by saying that in 1930 "they started from nowhere." During these years we have proportionately kept pace with the average rate of increase for the entire world while the Japanese have bettered this growth by five. This vast output has been gobbled up by a seemingly insatiable demand, and it is comforting to note a big new market fast developing, particularly in Germany and Italy, for staple fibre to be woven with both wool and cotton in order to cut costs and eke out supplies of the natural fibres. But it is disturbing to contemplate the day when the rayon market will be saturated.

To the chemical industry it is interesting indeed to note that during the depression viscose output has increased 92 per cent., acetate, 227 per cent. The spread between the two is still great in pounds, but the rate of growth indicates significant switches in the chemical consumption of this "white haired boy" among all the synthetic industries.

The Human Rights of Property

We men of the western civilization have enjoyed personal control of our own economic lives only about three hundred years. For some twelve hundred years we struggled desperately to wrest inch by inch our property rights from king, bishop, and feudal lord. In Asia, Africa, even in South America, millions have never yet been free to do the work they choose for wages they can spend as they please, to acquire property and will it to their children. And in Europe we see strong governments again snatching away the property rights of their people. The workman is forbidden alike to leave his job or to strike. The industrialist dare not, without permission, build a new factory and he is jailed if he sends his funds abroad. The long fight for economic liberty has been lost in those countries. It will be a bitter, gruelling battle to rewin them. For no people without property rights ever had any political power. Property is the very pedestal of liberty.



C. D. Alcohol

Facts — Formulas — Figures

By M. H. Haertel

SOCIAL considerations and government necessities combine to impose a heavy excise tax on beverage alcohol. Manufacturing operations, on the other hand, require a low-cost raw material and cannot bear even a moderate tax on industrial alcohol.

England's was the first government to solve the dilemma. In 1856 Parliament provided for "methylated spirits," a mixture of ethyl alcohol and methyl—or wood—alcohol. Other European nations rapidly followed suit. The United States was laggard. Our tax free alcohol law was enacted June 7, 1906 and denatured alcohol came into being officially January 1, 1907. Much subsequent trouble would have been avoided had we adopted the English term—"methylated spirits"—thus reducing the association in the popular mind between the foundation for a beverage and an essential industrial raw material.

The original tax free alcohol law provides that alcohol—

> "may be withdrawn from bond without the payment of internal revenue tax for use in the arts and industry and for fuel, light and power provided such alcohol shall have been mixed with methyl alcohol or other denaturing materials or admixture of the same suitable to the use for which the alcohol is withdrawn but which destroys its character as a beverage."

Protection of the government revenue requires that industrial tax free alcohol be made unfit for beverage purposes. As long as the Eighteenth Amendment was operative the government had the further duty of rendering non-potable all alcohol available to the general public. Control is accomplished primarily by the addition of materials with distinctive odor and taste—denaturants—supplemented by the usual checks of records and policing. Selection of a proper denaturing agent is the key to the problem.

European governments standardized on an impure form of methyl or wood alcohol. England incorporated the term in its name for the product:—"methylated spirits." Wood alcohol has a number of advantages; it gives unmistakable warning of its presence by disagreeable taste and odor; it does not yield readily to unlawful manipulation; it does not interfere with industrial use. Congress accepted methyl alcohol as the standard denaturant; in its first formulas the Treasury Department as a matter of course prescribed "approved wood alcohol." This denaturant protected completely denatured alcohol until January 1, 1931, almost a quarter of a century, and is still used in the proprietary solvent based on specially denatured alcohol No. 1, a grand total of about 750,000,000 gallons.

While heeding the suggestion made by Congress, the Department did not proceed in perfunctory manner; chemists in the government laboratories maintained constant search for additional denaturing formulas. This research has been in progress for 30 years, and will no doubt continue indefinitely. A new formula is a challenge to the bootlegger; we witness the chemical version of the contest between armor and projectile: the government does well if it keeps a few jumps ahead of the "cleaner."

Formulas are expressed, not in percentages, but in number of parts of denaturants added to 100 parts of ethyl alcohol not less than 160° proof.* There are two groups of formulas:—completely denatured, available almost without restriction to the general public, and specially denatured, authorized for particular purposes and obtainable only by permit and under bond. These specially denatured formulas are frequently modified to suit changes in manufacturing formulas, are not of wide application, and will not be discussed here.

Ethyl alcohol producers occasionally protest that they are compelled to sell along with each gallon of their own product a large amount of material in which they have no financial interest. For example, if ten parts of denaturants are added to 100 parts of ethyl alcohol, they must dispose of 110 gals. of denatured alcohol in order to sell 100 gals. of their own commodity. Of the two complete formulas authorized today, No. 5-A pre-

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* The origin of the term "proof" is obscure. In this country 200 proof is equivalent to 100% pure. What it means in England was explained in 1927, when Mr. Snowden, in Parliament debate, asked Mr. Churchill the meaning of the phrase "degrees in proof spirit." The reply was lucid:—"I must explain for the information of Mr. Snowden, that when we speak of these degrees, what we mean is degrees of proof spirit, and when we speak of degrees of proof spirit, what we mean is these degrees." (Reported in *N. Y. Times*, Oct. 18, 1932.)

scribes 3.75 parts of denaturants, and No. 10, 12.5 parts. The complaint is not without merit.

The first formula,—formula No. 1—authorized September 29, 1906, adhered closely to the European practice, containing ten parts of approved wood alcohol and a trace of benzine; the latter was included because, when water is added, it separates out, producing a cloudy effect. Intended primarily as a solvent in general, and for shellac-cutting in particular (anti-freeze was as yet an unimportant item, confined largely to hydraulic jacks), it was continued with only slight changes and one short suspension to January 1931—almost a quarter century of service, without any diversion so far as official records show.

In the same year Treasury authorized formula No. 2, containing two parts of wood alcohol; the deficiency in protection was made up by one half part of pyridin, —"skunk oil"—which has perhaps the most nauseating and repulsive odor of any substance known to man. The formula was never popular, and was swept aside in the general housecleaning of 1926.

Entry of the United States into the war in 1917 created many problems for our chemists. One of these was the need for solvents for airplane dope. Methanol, acetone, and ethyl acetate were in such demand for this purpose that the government commandeered the entire production of the hardwood distillation industry, thus threatening a shortage in denaturing grade methanol.

In the years immediately following the armistice, the demand for anti-freeze alcohol expanded. It was obviously impossible to supply the market with a formula calling for 10 parts of approved wood alcohol. Since No. 2 failed to go over, a variant, replacing half the pyridin with one half part of benzine, was authorized December 29, 1919, as No. 5. This number was destined to undergo many changes until it was finally abandoned in 1935.

Research in the Treasury laboratory led to practical tests of two new types of formula, neither of which proved satisfactory. A combination of sulfuric ether, benzine and pyridin was authorized in 1917 as formula No. 3; the optional use of the less odorous aniline oil instead of pyridin was granted in 1922. Beginning in 1919 there came a short-lived benzol series; formula No. 4 contained 2.5 parts, along with nitrobenzol and pine oil; No. 6, in 1920, had 2 parts of benzol with traces of pyridin and benzine; No. 7, of 1923, combined benzol (2 parts), benzine (2 parts) and aniline oil (1 part). All of these were abandoned in 1926.

The Eighteenth Amendment was declared operative in 1920. Its restrictions on long-time habits were a challenge to the ingenuity of a large group of our citizens; recipes for "bath-tub" gin were a favorite subject of conversation in club and drawing-room. Amateur efforts yielded meager results. Production of extra-legal beverages rapidly passed into the hands of professionals. By 1923 the bootleggers had begun to tamper with the non-methanol formulas of denatured alcohol, and "cleaning" became a standardized operation.

This abuse became so widespread that in 1926 there was a general revision of denaturing formulas. The benzol and pyridin formulas (Nos. 3, 4, 6 and 7) were discarded. The two-part wood alcohol formula (No. 2) was likewise abandoned; No. 5 was strengthened by increasing the wood alcohol content to 4 parts, and replacing the one-fourth part of pyridin with three-fourths parts of a new material, the petroleum derivative, aldehol. After twenty years of experience, the formula structure was for all practical purposes back where it started:—No. 1 with ten parts of wood alcohol, and No. 5 with four parts of the same substance (instead of the two parts of No. 2). All other "complete" denaturants had to be discarded.

The word "aldehol" is the first of a long line of terms that form an interesting chapter in chemical terminology. The etymologist of the future will have to ponder the series:—aldehol, calol ethatate, alcotate, denatol, calorite. All of these substances are of petroleum origin, and are as appetizing as the spent oil dripping from a crank-case. Added to the list is Pontol (from du Pont) and Tecsol (from Tennessee Eastman Corporation).

The 1926 basis was satisfactory. No. 1 had for twenty years been acceptable to shellac cutters and other industrial users of alcohol as a solvent. No. 5 was well adapted to anti-freeze use, which had become important because of increasing winter use of automobiles. Both were proof against the manipulation of the bootlegger, who, after he had been cut off from specially denatured alcohol and ethyl acetate, turned to direct distillation of grain, corn sugar and molasses, rather than tamper with a wood alcohol formula. All was quiet until the cry of "poison liquor" was raised. Then industrial chemistry became suddenly involved in a lusty battle between Wet and Dry.

The then Secretary of the Treasury, Mr. Mellon, stated his position in January 1927, as follows:—

> "The Treasury does not wish to use dangerous substances as denaturants, but Congress has imposed upon the Treasury the duty of specifying an effective denaturant readily available to industry. An effective denaturant not harmful, if used for beverage purposes, has not yet been found, although research is continued. The Treasury feels, then, that it has not the discretion, under existing law, to abandon an effective denaturant in favor of one not harmful but ineffective." (Senate Document No. 195, January 11, 1927.)

For some years the Treasury Department battled to maintain this position which both administratively and economically was sound. However, popular clamour against "poison liquor" continued and as of January 1, 1931, formula No. 1 was suspended while the wood alcohol content of No. 5 was replaced by aldehol and alcotate. Industry had to yield to politics.

One important concession was made to the shellac cutters, who insisted that they must have an adequate solvent without restriction, so that permission was granted to treat specially denatured alcohol No. 1, containing 5

parts of wood alcohol, with 5 parts of ethyl acetate and a petroleum marker, and to distribute the product as a solvent under a proprietary name. The new complete No. 5 was left as the only anti-freeze formula. The public objected to the nauseating odor and the result on production was promptly apparent.

This is the period of aldehol, alcotate, denatol, calorite and other newcomers in the chemical field. The products were untried as denaturants and frequent changes were necessary. The first version of the new No. 5 ran from January 1, to July 15, 1931. The second, containing isopropanol and alpha terpineol, from July 15, 1931, to July 1, 1932. The third ran three years to July 1, 1935.

The Treasury Department reports:—

"In contrast to the increased use of specially denatured alcohol, the consumption of completely denatured alcohol, which is marketed chiefly as an anti-freeze solution, reached a new low in the downward trend that has been evident for the past several years." (Statistics on Industrial & Beverage Alcohol, fiscal year ended June 30, 1934, p. 2.)

In the following year the department reported: "The consumption of specially denatured alcohol continues to exceed the consumption of completely denatured alcohol." The tail was beginning to wag the dog.

In an attempt to correct this situation two new formulas were authorized on June 30, 1932:—5-A, in which the 5 parts of isopropanol in No. 5 were reduced to 2.5 parts, and 3 parts of Pontol were added, and No. 10, in which the new product Tecsol made its bow. This denaturant is worthy of special note.

Tecsol contains higher alcohols, oils, etc., removed from crude wood alcohol in the refining of natural methanol. While it is malodorous, its sponsors claim that it is not as nauseating as are the petroleum derivatives. It represents an attempt to retain elements of approved wood alcohol that have denaturing value, while at the same time eliminating the methanol content. Its popularity is shown by the rapid increase in the use of No. 10 from 1,700,000 gals. in 1933 to 14,000,000 gals. in 1934 and 32,200,000 gals. in 1935, in which year Nos. 5 and 5-A had shrunk to a total of 5,800,000 gals.

The widespread dissatisfaction with the series of formulas initiated in 1931 was only partially allayed by the proprietary solvents based on SDA No. 1. Criticism came to a head June 30, 1934, when a representative group of producers and consumers of denatured alcohol appeared before the Treasury Department and petitioned for a new formula containing seven parts of approved methanol. Treasury chemists recommended granting the request. However, the Secretary was not prepared to take the step, and denaturing efficiency again had to yield to other considerations, not contemplated by Congress when the law was passed.

Hope that repeal might stop the bootleggers was quickly dissipated. "Cleaning" of denatured alcohol remained a serious problem. The generally unsatisfactory situation prompted the Treasury Department to take up the whole question *de novo*. A corps of research chemists was set to work to devise new formulas, their minds entirely free from preconceived or inherited ideas. It was the New Deal in the alcohol field.

The methods of bootleg chemists were now known, and the government chemists were in a position to work with a definite objective in mind. The situation at present may be summarized thus:

1. While there is no such thing as a perfect denaturing formula, it is possible to make cleaning operations so expensive, complicated, and risky that the recovered alcohol will not be worth the cost involved.
2. No permanent formula can be devised. Bootleggers will always find chemists of high technical ability and low ethical standards. The government must be on the alert, and have a new formula available at all times.
3. No one denaturant can withstand all manipulations known to the bootlegger today; it is necessary to incorporate an ingredient to meet each method of attack; the formula must be tailor-made.

The application of these principles resulted in the announcement May 27, 1936, of the modification of the two existing formulas, Nos. 5-A and 10.

The first of these prescribes 6 ingredients, totalling 8.75 parts of denaturants per 100 parts of ethyl alcohol; it depends on isopropanol, Pontol, and methyl isobutyl ketone. The second has 5 ingredients, totalling 12.5 parts of denaturants, consisting principally of Tecsol (5 parts), with Pontol, isopropanol, and methyl isobutyl ketone. Treasury chemists who are thoroughly familiar with the devices of the bootlegger, believe that these formulas will resist any manipulation known today. Only experience can tell when a revision will be necessary.

Limitation of space forbids a detailed analysis of statistics; only a few figures will be quoted from the official records.

In the fiscal year ended June 30, 1908—the first full year of operations—production was 3,300,000 gals., about equally divided between complete and special. Output in each group increased gradually to a total of 10,400,000 gals. in 1914. In 1915, the World War with its demand for solvents made itself felt:—

	Complete	Special	Total
1915	5,387,000	8,600,000	13,987,000 gals.
1916	7,872,000	38,807,000	46,679,000 "
1917	10,509,000	45,171,000	55,680,000 "
1918	10,328,000	39,835,000	50,163,000 "
1919	9,977,000	28,294,000	38,271,000 "
1920	13,528,000	15,308,000	28,836,000 "

Following the post-war adjustment, the demand for anti-freeze alcohol became important. The complete formulas gained on the special with the following results:

	Complete	Special	Total
1930	58,142,000	47,646,000	105,788,000 gals.
1931	49,136,000	37,173,000	86,309,000 "

The fiscal year 1932 was the first to show the effect of the abandonment of approved wood alcohol in completely denatured alcohol, and the distribution of a proprietary solvent based on SDA No. 1:—

	Complete	Special	Total
1932	34,298,000	44,031,000	78,329,000 gals.
1933	26,524,000	35,076,000	61,600,000 "
1934	27,174,000	55,067,000	82,241,000 "
1935	38,747,000	58,284,000	97,031,000 "

The decrease in completely denatured alcohol measures approximately the loss of anti-freeze business to competitive products, and the transfer of the business formerly done in CDA No. 1 to the SDA No. 1 solvent.

It is too early to measure the effect of the 1936 formulas.

Congress imposed on the Treasury Department the obligation to encourage the use of alcohol in the arts and industries, subject only to the superior tax-interest in beverage alcohol. Denaturants are to be selected on the basis of scientific and industrial considerations. Now that the 18th Amendment has been repealed, extraneous considerations will certainly not have the effect they had during Prohibition and the law can again be administered in accordance with Congressional intent.

Industry's Bookshelf

Elements of Chemical Engineering by Walter L. Badger and Warren L. McCabe, McGraw-Hill Book Co., 330 W. 42nd st., N. Y. City, 660 pp., $5.00.

For many years an utter lack of suitable text-books on chemical engineering was a distinct handicap. Finally a number appeared but many were subject to the criticism of being too involved for the usual one-year course. The first edition of this book was brought out to correct this situation, and the 2nd edition has been carefully revised and the necessary additions made.

Flavours and Essences by M. H. Gazan, D. Van Nostrand Co., 250 4th ave., N. Y. City, 115 pp., $10.00.

Books of practical value on the formulation of essences and flavors have been conspicuous by their absence largely because few chemists are willing or able because of business connections to disclose such information. Much of the data given in this book has never before been disclosed.

The House of Goodyear by Hugh Allen, The Goodyear Tire & Rubber Co., Advertising Dept., Akron, Ohio, 416 pp., $1.00.

Not only a complete history of the Goodyear Company and the part it has played in the development of the rubber industry in this country, but also a very interesting story of the entire industry.

Textile Fibers and Their Use by Katharine Paddocks Hess, 374 pages, Lippincott, $2.00.

A first-class elementary textbook, splendidly illustrated and finely written in non-technical style.

A Hundred Years of Medicine by Wyndham E. B. Lloyd, 344 pages, Duckworth (London), 15 s.

Might well be subtitled Medicine's Debt to Chemistry and Biology—an extremely capable history from the English point of view; contains interesting chronological tables, a good bibliography and a thoroughly capable index.

The Ebb and Flow in Trade Unionism by Leo Wolman, 251 pages, National Bureau of Economic Research, $2.50.

A timely study of trade union membership, policies, and relations with the Government, covering the depression years, presented with remarkable disinterestedness, which deserves the careful attention of anyone dealing with labor problems today.

The Making and Moulding of Plastics by L. M. T. Bell, 238 pages, Hutchinson's (London), 12 s, 6 d.

An unexpectedly valuable book covering both materials and technique, written by a man well versed in both the theoretical and practical aspects of plastics molding.

Dictionary of Technical Terms by F. S. Crispin, 270 pages, Bruce, Milwaukee, $2.00.

The working words of chemistry, engineering, aviation, metallurgy, etc., simply defined from the practical point of view.

Economic Geology of Mineral Deposits by Ernest L. Lilly, 811 pages. Henry Holt, $5.00.

A complete compendium which, judged by its chapters on potash, sulfur and phosphate rock, is apt to be more valuable historically than as a description of actual conditions existing since the depression which has caused profound changes in sources and supplies.

Pharmacognosy by Edmund N. Gathercoal and Elmer H. Wirth, Lea & Febiger, Philadelphia, 852 pp., $7.50.

This new text particularly presents the recent researches on the chemistry of drugs. Present volume is based upon the 3rd edition of Kraemer's Pharmacognosy.

This Labor Union Racket by Edward Dean Sullivan, 311 pages, Hillman-Curl, $2.00.

A slashing account of the racketeers, radicals and politicians who have muscled their way into the labor unions of the country—good "supplementary reading" to the Dewey investigation reports of the daily newspapers.

National Income and its Elements by Robert F. Martin, 134 pages, National Industrial Conference Board (N. Y.), $2.50.

We speak lightly of national income as an index of prosperity. Few realize that it is an estimate based on scanty data and apt to be biased by one's personal conception of income and its source. This careful study is an invaluable contribution to clear thinking on this subject.

Properties of Matter, by F. C. Champion and N. Davy, 296 pages. Prentice-Hall, Inc., 70 5th ave., N. Y. City. $4.50.

An up-to-date reference book and text for students of physics and physical chemistry. It stresses modern methods and principles. The subject comprising the Properties of Matter forms an ill-defined group and the authors have attempted to treat selected topics adequately rather than to cover a very wide field. The book is primarily designed for the advanced student.

Chemical Securities

An Analytical Study of Stock Market Quotations and Net Earnings of Chemical and Other Industrial Corporations

By F. A. Hessel and M. S. Hessel

IT has been pretty well proved during the recent depression, that in the long run the stock market reflected quite accurately the strength or weakness of both industrial groups and particular companies. Stocks of economically strong and financially healthy corporations took a less precipitous tumble from the heights of 1929 to the depths of 1932 than did those representing companies whose financial position and economic status were unsound. Day by day quotations are largely determined by purely technical market conditions. But the long trend of security prices is influenced to a very great extent by actual earnings and to a somewhat lesser degree by prospective earning power and property values of the companies represented. It is safe to say that stock price movements sooner or later follow the trend of the earning's curve.

Likewise, the stocks of certain industries which, being intrinsically resilient were able to earn some money even in bad times, had a firmer tone during the slump than those of companies which could not make a profit when economic conditions were unfavorable. Among the strongest were chemical stocks. Because, while the profits of the average chemical company shrank considerably between 1929 and 1932, they did not disappear altogether as did those of industry in general.

This is shown in Table I which gives the net percentage return on capital and surplus, for 1929 to 1935 for a representative group of companies.

Table I

Net percentage return on capital and surplus for 1929-1932 for representative group of companies.

	1935	1934	1933	1932	1931	1930	1929
Chemicals	10.8	8.6	8.1	3.9	6.1	8.3	12.7
All Industries	6.6	4.4	2.7	..	3.3	7.1	10.6

Chemical companies in 1929 were earning quite a bit more than the average industrial concern (12.7% as compared with 10.6%) and suffered a slightly larger setback in profits in 1930 than did industry in general. In 1931, however, the profits of chemical companies declined only from 8.3% to 6.1%, while those of all industries had been reduced from 7.1% to 3.3%. By 1932 chemical companies showed a profit of 3.9%, while industry in general was in the red. Moreover, by the next year these chemical companies had staged a wonderful comeback, earning 8.1% (almost as much as in 1930), whereas industry in general earned only 2.7%.

During 1934 all industries showed a much larger increase in profits than did these chemical companies and made still more progress in 1935. However, the fact remains that the return on capital invested in these chemical companies was over 60% greater in 1935 than on that invested in other industries.

Still more interesting is Table II which gives the percentage return on the average invested capital for representative groups from 1929-1935.

While chemical companies earned more than the average in 1929, their profits were less than the automobile companies, earning 22.2%; copper companies, earning 15.0%; and electrical equipment, earning 14.8%. By 1930, chemical companies were the third highest in profits and had lost less ground than the groups ahead of them the year before: Automobile profits shrank from 22.2 to 11.2%; copper from 15.0 to 3.5%; electrical manufacturing from 14.8 to 10.1%. Already one group, cotton manufacturing companies, had ceased to show any profits. They were joined by the petroleum companies in 1931, when chemicals were earning more than any others except automobiles, (chemical 6.1%; automobile 6.2%) and electrical equipment companies were down to

Table II

Per Cent. Return on Average Invested Capital.
(Based on representative group of companies.)

Year	Chemicals	Steel & Iron	Petroleum	Copper	Automobile	Cotton Mfg.	Electrical Equipment
1929	12.7%	8.5%	8.8%	15.0%	22.2%	5.9%	14.8%
1930	8.3	4.7	4.4	3.3	11.2	..	10.1
1931	6.1	0.3	..	2.0	6.2	..	5.5
1932	3.9	..	1.7	..	..	..	0.4
1933	8.1	..	3.4	3.4	8.8	3.4	..
1934	8.6	..	2.3	..	7.8	1.6	4.5
1935	10.8	1.2	4.0	..	16.7	..	6.8

5.5%. By 1932, chemicals were earning the most with only two other groups in the black (petroleum 1.7% and electrical equipment 0.4%). Even automobile manufacturing had ceased to be profitable.

By 1933, however, automobile companies were back at the top earning 8.8%, though not far ahead of chemicals which earned 8.1%, and the latter still made progress in 1934 while automobiles dropped behind their 1933 figures. In 1935, however, automobiles once more took the lead, earning 16.7% followed by chemicals, earning 10.8% with all the others far behind.

In other words, only chemicals and automobiles have regained a good part of ground lost during the depression and the former remained most steady during the dark days.

Steadiness of Chemical Industry

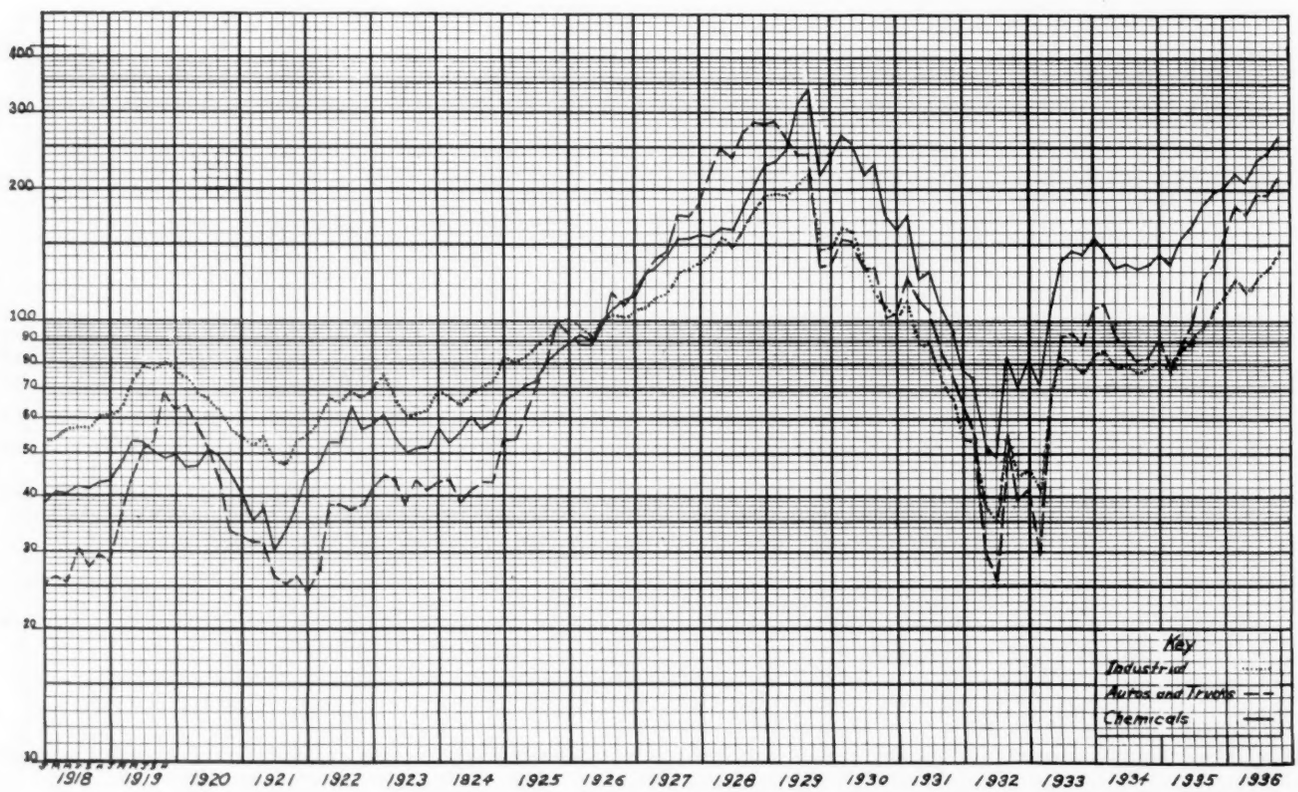
How the steadiness and resiliency of the chemical industry were reflected in the stock market is clearly shown in Table III which is a chart of the prices for chemical, industrial and automobile stocks from 1918-1936 (based on representative groups and using 1926 as 100).

We can now make three general observations: Automobile stocks have always been the most mercurial. Industrials, the steadiest from 1918-1926, did not climb as high as either automobiles or chemicals in 1929, fell below chemicals in 1932 and have not staged as good a comeback as the other two groups since then. Chemicals, starting lower than industrials and higher than automobiles, soon passed industrials and, though they made less progress between 1919 and 1926 than automobile stocks, were the leaders in 1929 and have kept ahead of both other groups ever since.

Studying the chart in detail, we find that chemical stocks rose only 36% from 1918 to 1919 as compared to 50% for all industries and nearly 150% for automobile. The latter, however, went down 63% from 1919 to 1921, as compared to 43% for chemicals, 40% for industrials. And chemicals staged the quickest comeback after that depression, going up over 100% between 1921 and 1922 as compared with 52% for automobiles and 44% for industrials. From 1923 to 1929, chemicals went up 563%, automobiles 631%, industrials 254%. Automobiles took the first big fall during 1929 going down 54% followed by chemicals, down 37%, and industrials, down 33% from the tops reached earlier in the year, and by 1932 automobile stocks were down 91%, chemicals 85% and industrials 83% from the highs reached in 1929. In the fall of 1932 automobile stocks were up 101%, chemicals 66% and industrials 55% from the lows reached earlier in the year. Since then automobiles have increased 715%, chemicals 426% and industrials 300% from the 1932 lows. At the end of 1936 chemicals had to advance 29%, automobiles 34% and industrials 33% to reach their 1929 highs.

Comparing with the earning chart, we see that the stock prices of chemical, industrial and automobile companies have followed pretty closely the earnings' curve of these groups, and that on both counts the chemical industry has shown up very well, less spectacular than the automobile group, but far above industry as a whole in steady earning power and stock prices.

Table III



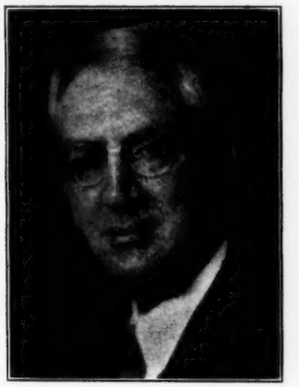
"PUBLIC RELATIONS" Means "*Relations with People*"

By William H. Easton, Ph.D.

Sheldon, Morse, Hutchins & Easton, Inc.

"PUBLIC Relations" is usually thought to mean certain organized activities carried on by railroads, public utilities, department stores and other large companies in connection with their relationship to the general public. Hence, as a rule, manufacturers who do business with industries and trades feel that they have no public relations problems and, therefore, no interest in the subject.

However, if instead of Public Relations we use the phrase "Relations with People," which means precisely the same thing, it throws a different light on the matter. All businesses, no matter how limited in their scope, have relations with people, and, in these days of intensifying competition, the right kind of relationships with customers and prospective customers is an important factor in sales promotion.



"Chemical manufacturers, as well as railroads and power companies, have public relations problems to solve."

Businesses, like people, can be divided into two classes—"introverts," who are chiefly interested in their own affairs, and "extraverts," who have a much wider range of activities.

Good Customer Relationships a Never-Ending Task

The typical introvert may be high-minded and generous, but he is rarely popular with his fellows. He wants to be let alone, and to be allowed to do as he pleases, and he dislikes talking about himself. If he is independently wealthy or exceptionally gifted, he can go through life very comfortably; but if he has to compete with others in active business life, he is likely to have a hard time, for, when really good jobs are being passed out, they generally go to extraverts. In fact, in order to be really successful in business, the introvert must change his ways and do some things that make for popularity.

The picture presented by the "introverted" business is much the same. Those in control become wrapped up in their own affairs; executives as well as employees become accustomed to handling every detail of the business in certain ways and hotly resent any effort to change their habits; sales promotion becomes confined to beaten paths; and little is done to enlarge the circle of the firm's contacts, broaden the vision of management, and make new friends.

Firms in an especially favored position may get into this state and still do a thriving business, but, under modern economic conditions, the almost inevitable result is a gradual loss of ground, chiefly because new business in increasing amounts is attracted elsewhere. Most business concerns, especially those engaged in manufacturing for limited markets, naturally tend to become introverted, and this tendency can only be counteracted by constant efforts on the part of management.

All organized work of this character falls within the field of Public Relations. In general its objects are two-fold:

1. To make doing business with the firm more agreeable for customers.
2. To increase the prestige of the firm so as to attract business that might otherwise go elsewhere.

The first of these lines of work is concerned with employee and corporate behaviour. It starts with the voice of the telephone girl and continues until every possible policy of the firm reflects the customer's, and not the factory's, point of view. It is not, however, a job that can be done once and for all—it is a never-ending operation requiring eternal executive vigilance.

Prestige Helps to Build Business

The second line of work, prestige building, is a major activity with certain companies in every line of industry; but the majority of firms, especially the smaller ones, neglect it and then wonder why so much new business seems to escape them. What must be done to build a firm's prestige can be determined only by a careful study of individual cases, but the following steps are frequently indicated:

Extension of advertising and sales promotion beyond the narrow limits of the firm's primary market.

Participation of the firm's key men in the activities of trade and technical societies in their industry; especially, the making

of addresses which will be reported by interested magazines and, sometimes, newspapers, thereby securing the enhancement of personality that comes from appearing in print.

Contribution of articles to trade and technical magazines that are helpful to users of the firm's products, that record the technical progress being made by the firm, etc.

These are usually good beginnings, but only beginnings. As a matter of fact, the process of building prestige is a cumulative one. Once a start is made, and a firm and its leading personalities begin to be better known, opportunities multiply to serve their industry and the public in its relation to this industry, and "fame spreads."

Those who engage actively in this kind of work become well and favorably known to large numbers of people and are usually the first to be thought of when anything in their line is wanted.

Many Chemical Products Affect Public Welfare

What has been said so far applies to the relations between a manufacturer and his immediate trade. Such relationships are all that manufacturers in most lines need consider. But this is not the case with many in the chemical manufacturing industry, however narrow their direct sales field may be. Makers of commonly used poisons, explosives, disinfectants, insecticides, drugs, vitamins, or fertilizers cannot forget their products after they leave their hands. Such products directly affect human safety, health, and welfare; and the way the public uses these things and its attitude toward them are of vital importance to their producers.

Because of their very nature, many chemical products intended for general domestic or industrial use have great powers for both good and evil. The average layman knows little about their properties and must be carefully educated (often to an extent that seems unreasonable to a chemist) before he, or she, is competent to handle them properly. On the other hand, if these products are improperly handled, used, or compounded, injuries, and even fatalities, may occur. Such accidents are likely to get into the news, and even a few cases of this sort may arouse popular prejudice and provide ammunition for attack by competitors and for certain self-appointed guardians of the public's welfare.

Some years ago, a case occurred in which death followed the administration of a preparation said to contain Vitamin D. It has since been shown that Vitamin D is not toxic to man even in doses thousands of times greater than the amount contained in a quart of Vitamin D milk, and yet this case has been cited time and time again to prove the danger of taking Vitamin D in any quantity.

The cosmetic industry is still suffering from attack because in times past a few cosmetics containing harmful ingredients have happened to get on the market.

The demand for a certain valuable chemical compound used in homes and industries has been greatly curtailed because certain harmful effects are ascribed to it, whereas these effects are actually the result of quite different causes.

When cases of this sort arise, they call for public relations work of a high order. The public must not only *be* protected, but it must be *convinced that it is protected.*

Usually, such cases affect groups of manufacturers and are best handled through group action. Groups can deal with the public more effectively, at lower per capita cost, and with greater authority than can individual concerns, and this form of cooperation appears to be favored by the chemical industry. The writer has before him the public relations programs of fifteen associations of manufacturers and professional users of chemical specialties and these represent only a fraction of the group activities of this branch of the industry.

A study of this material indicates that much attention is being given at present to two lines of work in the public relations field:

(1) "Protective" operations, with the object of protecting, first, the public, and secondly, the industry from inferior products or the misuse of good products.

(2) "Constructive" projects, designed to develop markets for chemical products by educating the public as to advantages and method of their use.

Steps that Protect Public and Industry

A comprehensive "protective" program for a given, widely used line of chemical products can be compiled from these data as follows, though, probably, no single group is carrying out every activity or step indicated.

1. Develop (with the aid of scientific, medical, health, government, or other authorities, where necessary) acceptable standards of quality and safe practices in respect to packing, shipping, handling, and using the products.
2. Carry on, or follow, research work that improves the products and the service rendered by the group.
3. Establish, or select, an authoritative agency that can validate the value and quality of the products.
4. Establish, or select, an authoritative agency that can pass on all claims made in advertisements.
5. Educate the entire industry, makers and users, in all matters pertaining to the application of the products.
6. Secure, through clipping bureaus and other sources, records of all accidents alleged to have been caused by the products.
7. Investigate all important cases and ascertain the facts.
8. Where the facts have been misinterpreted or misrepresented, lay the true facts before the proper authorities, in order to clear the records, and before the press, in order to secure greater accuracy in the reporting of future cases.
9. Inform the public, through various publicity channels, of the objects and policies of the group and the progress being made by it.

It is, perhaps, advisable to point out that "protective" campaigns of this character are not substitutes for aggressive sales promotional operations. Like defensive military measures, they may be necessary, but in themselves they are inadequate to secure positive results. It should also be stated that when minimum standards of quality are established for a given line of products,

CALCIUM CHLORIDE
ASSOCIATION NEWS
Research and Distribution of Information Relative to the Uses of Calcium Chloride
DETROIT, MICHIGAN
SEPTEMBER-OCTOBER, 1936
REMEMBER LAST WINTER?
Young Woman Bleeds To Death When Glass Throat In Wreck
50 Hurt Here As Icy Streets Jock Traff
PEDESTRIAN IS INJURED BY CAR
Auto Skids On Ice-Covered Highway
Three Suits on Skidding Crash
ICY STREETS CAUSE WRECKS
CAR SKIDS ON HIGHWAY, TIPS OVER 3 TIMES
TWO KILLED, SIX HURT IN ACCIDENTS
Two Women Die Machine Slides 79th St. Car
AUTO BURNED AFTER CRASH ON ICY ROAD
Ice-Packed Road Brings Accidents
CALCIUM CHLORIDE
FOR BETTER ICE CONTROL

When Will YOUR City Soften Its Water?
Exterior view of municipal water-softening plant owned by City of Austin, Texas, equipped by International Filter Company, Chicago, Ill.
THE progressiveness of Texas cities in the construction of modern, municipal water-softening plants is typified in the above view of the plant owned by the City of Austin.
Here lime and soda-ash are the principal reagents which contribute to the health, comfort and economy of its 60,000 citizens.
Municipal authorities in 110 other towns and cities throughout the United States are keenly aware of the civic asset of a water-softening plant. When will YOUR city join the increasing list of progressive communities?
When the tremendous economic waste which results annually from the use of hard water is fully recognized by the general public and manufacturing industries, there will be a widespread movement in favor of its elimination.
To every taxpayer and housewife, soft water will bring longer life to fabrics and linens, lowered laundry and soap costs, reduced repairs to heater coils and plumbing fixtures and decreased fuel bills of 5 to 10%.
No municipal investment can bring greater or more direct returns to its citizens than a water-softening plant, the initial cost of which is quickly returned in savings to property owners and industries.
Many municipalities already filtering their water supply can soften it at but slight additional cost. If the surface supply requires filtration and it is high in carbonate hardness, lime will serve both as a softening and purifying agent. Lime is an effective germicide and without question a most economical chemical.
Officials interested in securing further information on water softening and purification are requested to write the National Lime Association.
Rely on LIME -tested by time
NATIONAL LIME ASSOCIATION
An organization of leading lime manufacturers formed to encourage a better appreciation of the economic value of lime in all its uses.
718 CARRY BUILDING
WASHINGTON, D.C.

Two examples of outstanding publicity work by trade associations. Cooperative advertising has proven extremely valuable in several fields.

these standards tend to become maximum and may even retard progress unless effective efforts are made to sell products of better grades.

Campaigns of Public Education

"Constructive" promotional programs of public education are being carried out by a number of groups in the chemical industry. Some of these are addressed only to the "trade" and not directly to the general public, but the material presented is passed on so that in due time it reaches the public. Some examples from the material at hand are as follows:

The National Association of Exterminators and Fumigators develops suggestions for public education which are submitted to local groups for use in their communities.

The National Lime Association has in the past carried on extensive advertising in business magazines on the uses of lime in engineering, water supply treatment, and industrial work.

The National Association of Dyers and Cleaners is carrying out a plan to bring about closer cooperation between its industry and merchants and manufacturers and to emphasize technical problems that arise in the cleaning of various fabrics, especially newly developed ones.

The American Gas Association has in operation a national campaign in behalf of 700 gas companies. Women's magazines and radio are being used to reach the public, and industrial users of gas fuel are being reached through business magazines.

The American Potash Institute sends out scientific information relative to the use of potash in growing crops to agriculturists and is advertising in the farm press.

The Industrial Alcohol Institute is using various media to promote the use of anti-freeze.

The National Fertilizer Association has carried on many different types of educational work for years, including the publication of a magazine, the distribution of booklets, the making of addresses before agricultural organizations, and cooperation with government agricultural research workers.

The International Acetylene Association disseminates technical information to those interested.

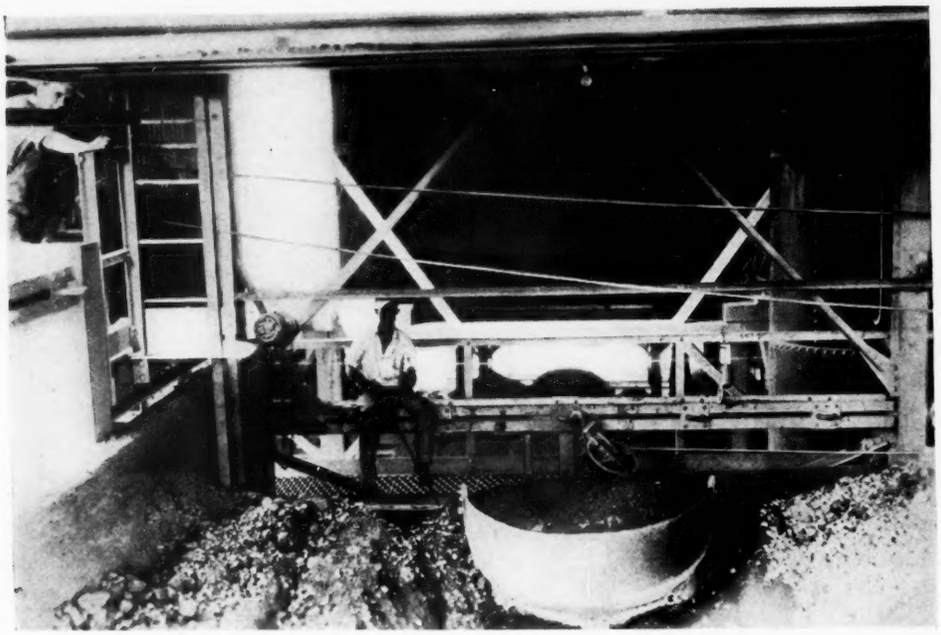
The Calcium Chloride Association has an extensive advertising and publicity program for keeping engineers and the public in touch with the advantages of applications of its products.

The American Soap and Glycerine Producers issue a bulletin entitled "Cleanliness Training" to home economists and are planning a campaign to promote soap-and-water cleanliness.

The theme of practically all of these campaigns is "Service to the Public" and their primary object is to improve the relations between the public and the sponsoring industry, thus forming a favorable background for the sales promotion work of the members of the group.

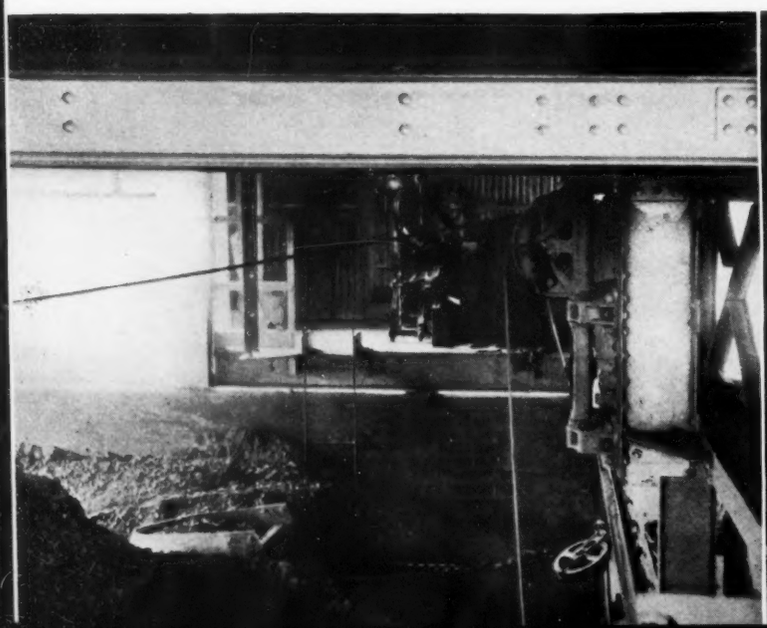
Not Alone for Sales Promotion

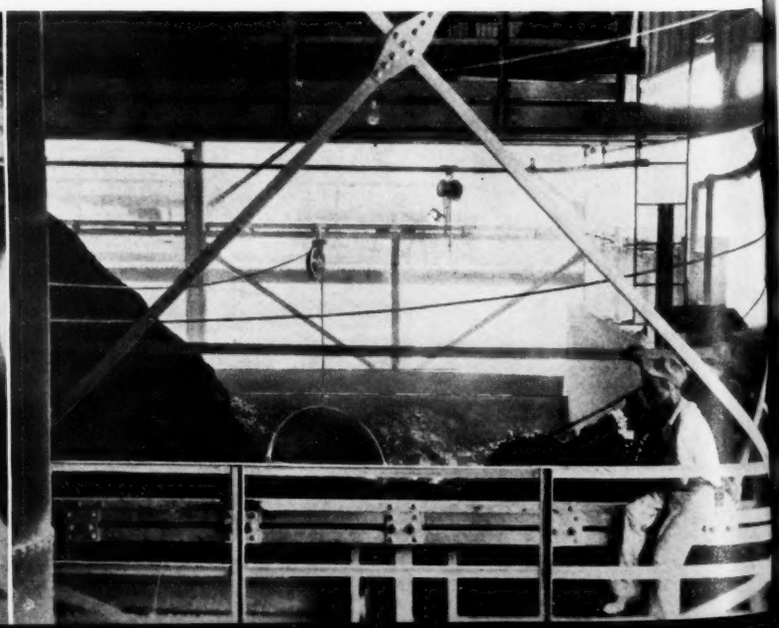
Regard for public opinion is not confined to sales promotion but enters into many other phases of business activity. The spirit of the times calls for a point of view that in many ways would have seemed quixotic to business executives of the past. Those concerned with public relations have to understand this point of view if they are to assist industry in making progress.



Mechanical Handling of BAUXITE

When larger drying kilns were installed at the drying and calcining plants of the Republic Mining and Manufacturing Company, a subsidiary of the Aluminum Company of America, located at Bauxite and Drury Spur, Arkansas, mechanical methods were also installed to supersede manual handling in the feed of the kilns. A small crescent drag scraper, operated by a system of cables and pulley blocks, now handles the "green" ore, brought from the nearby mines and deposited in an adjoining storage area, to the chutes leading to the kilns. Top, a loaded scraper approaching the mouth of one of the chutes. The arrangement of the U-bolt anchorages for the accommodation of the guide block may be seen along the steel frame-work on which the worker is sitting. Lower right, looking towards the storage area with scraper in the rear ready to haul a load of ore into the charging chute. The chain hoist on the overhead trolley rail is used for shifting the tail block so as to enable the scraper to reach different sections of the storage area. Left, looking across the chute end of the storage area to the power unit which operates the scraper, which is mounted on a platform just outside of the storage-room.





Chemicals in Petroleum Refining

Part 2

By L. F. Marek

Arthur D. Little, Inc.

MODIFICATION of lubricating oils through the use of addition agents has proved a fertile field for the adoption by the petroleum industry of a variety of chemicals. A consideration of the requirements for and the characteristics of a lubricant show why this is so. Thus, all lubrication conditions fall into one or the other of three main classifications:

(1) Full fluid film lubrication where there is a completely unbroken cushion of fluid lubricant between the metal surfaces; *e. g.*, bearing and journal, or light duty gears.

(2) Adsorbed film lubrication where separation of rubbing surfaces is maintained under very severe conditions of load, speed, or temperature or any combination by the action of selective components of the lubricant.

(3) Boundary or imperfect lubrication where the film is constantly being broken and reformed with consequent increase in abrasion and wear.

It is estimated that about half of the lubricating oil produced today is used for automobile engine lubrication. The rapidly increasing power, operating temperatures, and loads of such engines have resulted in unusually severe demands upon the lubricating oil.

Need for Improved Lubricants

The need for improved lubricants has been recognized by the leading refiners and recently new oils have been developed to meet this need. Super-refining by use of selective solvents, vacuum distillation, chemical treatment, etc., does not entirely fulfill the requirements and resort has been had to the use of potent addition agents to satisfy the particular deficiencies.

Thus, modifications of lubricants obtained from mineral oils by the usual physical means may have for their object any one or more of the following:

(1) Increase of "oiliness";
(2) Increase of load capacity;
(3) Increase of viscosity index;
(4) Decrease of pour point (pour-point depressants);
(5) Decrease of sludge formation in internal combustion engine use (antioxidants);
(6) Decrease of corrosion of metal parts.

These objects and means of attainment may be briefly discussed.

"Oiliness" has been defined as that which may cause a difference in the friction between two tests under identical conditions, in which the lubricant has the same viscosity at the test temperature and atmospheric pressure. Low friction is very desirable in lubrication since the power consumed in overcoming friction and dissipated into heat in a bearing is equal to the work done per unit time against frictional resistance. Much attention has been given to this phase of lubrication, but only comparatively recently have generalizations based on the work become available.

Although the uses of "oily" lubricants in such operations as metal cutting, wire drawing, etc., are fairly well recognized and their merits reasonably clear cut, attempts to make generalized application of the property to almost any kind of lubrication do not appear justified. The merits of lubricants with added oiliness factor in internal combustion engine lubrication have involved much controversy. However, the comparatively recently demonstrated ability of additions of tricresyl phosphate and dichloromethyl stearate to lubricating oils to reduce the wear of automobile engine moving-parts seems to justify their use in automobile engines. Two major oil companies now market oils containing added "oiliness" substances, called "germ" or "alloy" oils; and at least one non-refiner is selling such an addition agent separately under the name of "Lubrx." The use of beta-naphthol, as an antioxidant, increases "oiliness" by preventing oxidation of the natural "oily" components of the mineral oil.

Extreme Pressure Lubricants

"E. P." or extreme pressure lubricants have been developed for the lubrication of parts subjected to very high unit pressures as in the case of hypoid automobile gears. The question of "oiliness" is not involved since there is no question of friction reduction but only the generation of ability to momentarily carry rubbing loads far beyond the normal capacity of the surfaces. However, there may be a merging of the properties as in the case of some of the additions to increase "oiliness" which also increase load capacity.

The three elements most commonly used to give increased film strength to lubricants are lead, sulfur, and chlorine, generally in the form of lead soaps plus sulfurized or chlorinated fatty oils. Lead naphthenate compounded with well-refined, sulfur-low lubricants has a marked effect on load carrying capacity.

The development of automobile rear axle design toward hypoid gears has necessitated the entrance of most manufacture of lubricants into this field, and a

number of products are available on the market. Practically nothing is known of their detailed composition since compounding is difficult and involved and the technique in particular cases is not disseminated.

Lubricating oils tend to become more viscous with drop in temperature and to become more fluid with rise in temperature, with the result that an oil having the proper viscosity at a high operating temperature may be so viscous at winter temperatures as to make starting impossible, and similarly, an oil permitting quick starting on cold days may not lubricate properly at high operating temperatures because of too low viscosity. Hence, oils having a flat temperature-viscosity relationship are the most desired. With oils from Pennsylvania crude rated at 100 in this respect, the viscosity index, or V. I., has been devised to measure the approach of an oil to the ideal of a zero co-efficient. Thus, an oil with a V. I. of 80 changes more in viscosity with temperature than the equivalent Pennsylvania oil and one with a V. I. of 120 changes less.

Use of Addition Agents

It has been found possible to modify the V. I. of an oil in the desired direction by the use of suitable addition agents. Thus, by the addition of isoparaffinic, high molecular hydrocarbons obtained by the polymerization of the light ends of refinery gasoline ("Exanol" of the Standard Oil Development Company), the V. I. of an oil may be increased to a remarkable degree. Thus, by use of 5% additions it has been shown that the V.I. of a coastal distillate lubricating oil may be raised from 26 to 111, of a 90 V. I. distillate from 91 to 125, and of a Pennsylvania oil from 100 to 120.

Other means of improving V. I. include hydrogenation at elevated temperature and pressure, solvent extraction, treatment with aluminum chloride, and treatment with fuming sulfuric acids. However, these methods are limited in the degree of improvement possible and in economic respects.

The Standard Oil Company (N. J.) has a lubricating oil with high V. I. called "Univis" containing only hydrocarbon material.

Good lubricating oil base stocks always contain paraffin wax, a constituent which at low temperatures tends to crystallize out or solidify and thus prevents the oil from being poured. Removal of this wax by cold pressing, cold centrifuging, or solvent extraction involves additional expense, removes part of the lubricating oil fraction of the crude, and may interfere with desirable properties of lubricant quality of the oil. Since it would be desirable to have considerable of this wax component in the oil and still have an oil that would flow or pour at a low temperature (0° F. or below), means have been sought whereby the crystallization could be so modified that instead of coming down in large, interlaced crystals, the wax would precipitate throughout the oil in the form of small, compact crystals which would give the least tendency for solidification or marked increase in viscosity as winter temperatures were approached.

Thus, the Standard Oil Company (N. J.) has placed on the market their "Paraflow" and modified lubricants. This material is a hydrocarbon oil formed by condensing a waxy hydrocarbon with an aromatic hydrocarbon through a Friedel-Crafts condensation reaction. The Monsanto Chemical Company has developed and presented their "Santopour," a synthetic material closely resembling a petroleum product, for the same purpose.

As an example of effectiveness, a solvent refined S.A.E. 30 lubricating oil with a pour point of + 20° F., when treated with a 0.32% addition of "Santopour" has its pour point lowered to —20° or a 40° F. Lowering.

Numbers of other materials have been patented and some apparently placed on the market, but no data are available on their effectiveness. Thus, esterified hydroxy stearic acid, polymerized straight chain hydrocarbons of 10 C atoms or above, esters from acids obtained by oxidation of paraffin wax or oil, distearylnaphthalene, myricyl ethers of oxynaphthalenes, etc., may be mentioned.

Careful study of lubrication problems in connection with the automobile engine has shown that formation of sludge or insoluble tarry matter from the oil during use is one of the major factors determining the life of an oil; *i. e.*, the number of miles between changes. One of the results claimed for the various solvent refining processes is the reduction of sludge formation during use of the oil. However, it has been pointed out that some of the sludge forming components are the best lubricants, and this seems to be supported by the fact that such addition substances as castor oil, fatty oils, esters of fatty acids, etc., which improve oiliness, all tend to sludge badly. Furthermore, it has been found that sludging is directly associated with oxidation and laboratory evaluation of sludging characteristics depends upon oxidative procedures.

Control of Sludging

Effort has therefore been directed toward the use of "inhibitors" to control the degree of sludging an oil will undergo during use. These, on the whole, take on the character of oxidation inhibitors, and as such may function to reduce acidity formation as well as sludge formation.

Sludging inhibitors of the nature of p-nitrochlorobenzene, alpha nitronaphthalene, p-nitrophenol and other nitro aromatic compounds constitute one class of compounds. Oil soluble compounds of metals such as selenium, tellurium, chromium, tin, lead, etc., have been patented as sludge inhibitors. Organic sulfur compounds with sulfur joined to carbon, such as aromatic disulfides and mercaptans, combinations of dibenzyl sulfide with monosulfides of hydroxyaromatic compounds, etc., are claimed to reduce acidity due to oxidation. Antioxidants such as beta-naphthol, naphthylamines, hydroquinone, pyrogallol, catechol, polyhdroxy

aromatics, etc., are of value for inhibiting gum formation in gasoline but are generally considered to be insufficiently stable for use in automobile engine lubricating oils.

It may be concluded from a study of automotive lubrication that no matter how perfectly the bearings may be constructed and operated, or how nearly all the work is done on the oil film with no mechanical wear of metal upon metal, the bearing will ultimately be destroyed by the corrosion of the oil acids unless oxidation can be entirely prevented. The chemistry of such bearing corrosion is complex and in some cases, at least, appears to be due to the powerful adsorption of the polar (oxidized) molecules of oil on the surfaces and the subsequent dispersion of the adsorption-complex containing metal into the body of the lubricant.

Rapid Growth in Use of Diesel Fuels

Diesel fuels are rapidly becoming an important product of the industry, and with the more stringent quality requirements being imposed by the light weight high speed diesel engines being increasingly used for transportation purposes give promise of presenting some interesting possibilities through chemical dope additions.

The ignition requirements of diesel fuels are opposite to those of gasoline in that it is desired to have a fuel which will detonate for use in compression engines. Although methods for measuring this quality in laboratory engines are still in a development stage, some progress has been made by comparison of fuels with blends of cetane and alphamethyl naphthalene in special engines, and an effort made to rate these fuels by a cetane number, just as gasolines are rated by octane number.

Fuels with high hydrogen to carbon ratios such as may be obtained by straight running certain crudes have, in general, the best ignition characteristics for diesel use. Cracked fuels such as may be obtained from the synthetic crudes produced in cracking for gasoline tend to have anti-detonant characters, just as the gasolines do, and it is with these fuels, principally, that addition agents may prove beneficial. The addition agent must have the characteristics of a pro-detonant in that they must reduce ignition lag and a number of these have been suggested in the technical and patent literature. Thus, acetone peroxide, tetrahydronaphthalene peroxide, nitric acid esters, aldehydes, organic nitrates, etc., have been mentioned. In general, ethyl nitrate and amyl nitrate are too expensive, acetaldehyde is too volatile, benzaldehyde decomposes too fast in storage, and the peroxides have been insufficiently evaluated for extensive present use. On the basis of present knowledge, it seems improbable that addition agents for diesel fuels will assume the relative importance that they have for gasoline.

In the manufacture of greases the petroleum industry has long made use of certain soaps which when added to lubricating oils result in a gel formation of the oil. Calcium soaps have been used in large amounts for the manufacture of cheap greases and greases resistant to water. Sodium soaps are used for the manufacture of greases with high melting points for application in high temperature locations. Recently, the brilliant, transparent character of the aluminum soap greases has attracted the manufacturer and aluminum soap greases are finding increasing use despite certain inherent difficulties in manufacture. For application to special cases requiring high load carrying capacity greases made with or containing lead or zinc soaps have been manufactured.

One of the requirements for a good grease, frequently difficult to attain in conjunction with other qualities, is stability to mechanical working. Also a certain variability, affecting the character of the grease, has been found to occur in the solvation of the soap by the oil when lubricating oils of different viscosities or from different type crudes are used. Efforts have been made to find materials which through relatively small additions wou'd furnish a means to solve the first difficulty and enable some control to be had over the second. Patents have appeared claiming the use of substances like cobalt, cadmium, and manganese soaps, polyhydroxy aromatic compounds, etc., for accomplishing the mechanical stabilization desired, but it is not known to what extent these are successful. Nevertheless, they are indicative of the possible modifications that await development.

Conclusion

It will be appreciated that in a discussion of this length it is not possible to cover adequately all of the chemical aspects of petroleum refining. Thus, many substances that have been mentioned in patents for operations discussed herein have not even been named; a number of refining practices which consume chemicals such as corrosion control in the cracking of "sour" crudes* have not been discussed, some of the newer aspects of petroleum refining such as hydrogenation, polymerization, and chemical utilization have not been mentioned, and the broad aspects of the petroleum chemical industry only alluded to. However, the presentation of a picture of the tremendously important role played by chemicals in the ordinary, present day refining practices has been attempted.

*Review of Reports of the American Petroleum Institute Committee on Corrosion of Refinery Equipment since 1928, by Marks, Oil & Gas J., November 11, 1936, p. 183-190.

Preservation of Green Fodder

The A.I.V. method for the preservation of green fodder developed in the laboratories of the Finnish Co-operative Butter Export Association, originally employed a mixture of hydrochloric and sulfuric acids. It has recently been found that satisfactory results are also obtained by employing sulfuryl chloride mixed with water. The solution prevents decomposition of fodder rich in protein and comparatively poor in sugar. *Chemical Trade Journal*, Jan. 22, 37, p81.

Steam and Heat Accumulation in Chemical Plants

By C. H. S. Tupholme

ONE of the problems in chemical power plants, particularly where much heat is used for processing in addition to that required for power, is that of maintaining as constant a load as possible on the boiler plant, notwithstanding the fluctuating demands which may occur from time to time during the working day. There are very few cases indeed where the steam demand is constant and thus, while an installation may be operated at very high efficiency on full load, there are periods when the lightness of the load calls for small steam output and involves low efficiency. Nevertheless, the capacity of the plant must be capable of dealing with the peak load. In cases like this (and they are very numerous), it is apparent that any method has a high economic value that will enable the plant to operate for normal output during periods of low load and conserve the heat for use during periods of peak load. Such a process not only secures more efficient working through the whole period, but allows much higher peak demands to be met without increasing the capacity of the plant. Fortunately, steam and heat accumulators, which have come so much to the front in recent years, afford this facility.

The accumulators in common use today may be divided into two groups—variable and constant pressure types. The difference in the manner of their operation is already expressed in the title, though in practical use the difference is largely discounted by the fact that within certain limits a constant pressure accumulator operates also as a variable pressure accumulator.

The method of operation of the variable pressure accumulator is based on the fact that water when practically at boiling point, partly evaporates if the pressure is reduced, the remaining water being cooled. If, for example, in a tank there is water at 360° F. and 140 lbs. per sq. in., when the tank is opened, steam will escape and the pressure will drop. The greater the quantity of steam removed from the tank, the greater is the drop in pressure. If the pressure is reduced to 70 lbs. per sq. in., about six per cent. of the original volume of water in the tank is evaporated, while the remaining 94 per cent. has decreased in temperature to about 300° F. Conversely, the water cooled in this manner can again absorb a certain quantity of heat if the pressure is increased; that is to say, it can condense a certain quantity of steam. When charging, steam is absorbed, and when discharging, it is given up.

The principle of operation of the variable pressure accumulator, therefore, requires a decrease in pressure when discharging and an increase of pressure when charging. The steam pressure with which the accumulator is charged is always greater than that of the steam given off when discharging.

Therefore its use is avoided where such variations of pressure are not desired, for example, when supplying a steam turbine, since the loss of pressure causes an increase of the heat consumption and pressure variations necessitate a special design of turbine.

The variable pressure accumulator has been known for a long time. The Rateau accumulator is also a variable pressure accumulator, and its operation depends upon the physical property of water already mentioned. Better known, however, is the Ruths variable pressure accumulator. In general the variable pressure accumulator is connected between two steam circuits of

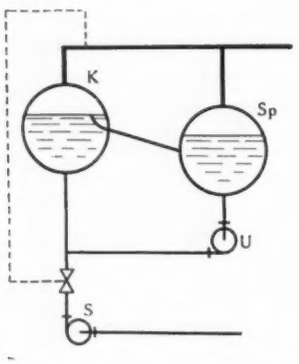


FIG. 1.—Constant pressure accumulator.
K. Boiler.
Sp. Accumulator.
S. Feed pump.
U. Circulating pump.

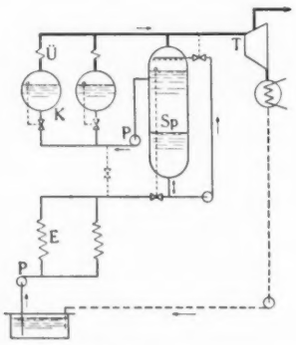


FIG. 2.—Constant pressure accumulator by difference in density in a paper mill. (Live-steam accumulator.)
E. Economizer. Sp. Accumulator.
K. Boiler. T. Turbine.
P. Pump. Ü. Superheater.

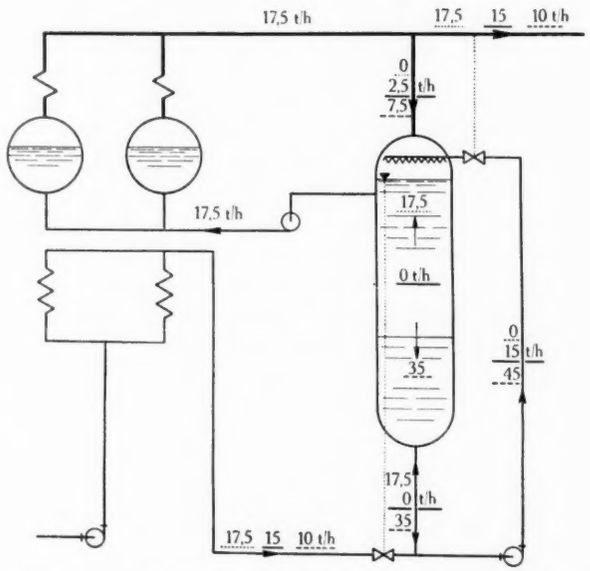


FIG. 3.—Diagram of connections with a numerical example for a live-steam accumulator.
— · — · — When discharging. ———— Normal conditions.
· · · · · · · · · When charging.

different pressure, and when charging, is supplied with steam from the high-pressure circuit, and when discharging, gives up steam to the low-pressure circuit. For charging, the so-called "bypass" valve is employed. The steam can be given up through a reducing valve to the low-pressure circuit. The bypass valve is controlled from the high-pressure side, and the reducing valve from the low-pressure side. With these appliances the high pressure steam must always be accumulated before it can be utilized. In many cases, for example, in power stations, the two circuits of different pressure must first of all be artificially created, so that a variable pressure accumulator can be inserted.

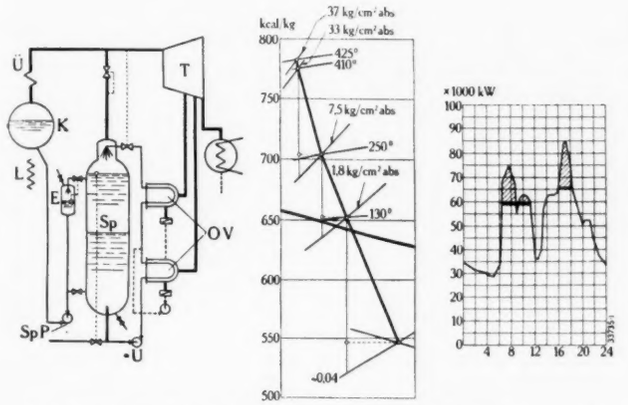


FIG. 4.—The covering of peak loads by constant pressure accumulation by using bleeder operation.

E. Degasifier.
K. Boiler.
L. Air preheater.
Sp.P. Feed pump second stage.
Sp. Accumulator.
T. Turbine.
U. Circulating pump.
Ü. Superheater.
OV. Surface feed water heater.

Constant pressure accumulation, of which the Kiesselbach is an example, depends on the fact that when there is a surplus of heat, water for any required purpose is heated and stored, while, when there is a shortage of heat this water is taken from the accumulator and used. In contrast to the variable pressure accumulator, therefore, not steam but water itself is taken from the constant pressure accumulator. For this reason the constant pressure accumulator can be employed in all cases where hot water is required, in quantities worth mentioning, for any purpose; for example, in laundries, mine service, dyeworks and similar installations.

An important field of application for the constant pressure accumulator is the storing of feed water, simply because feed water is required in all steam power plants. The simplest method of storing feed water is to utilize the water space in the boiler as is done by every stoker from his practical experience. The intention is, with increased steam requirements, to reduce the quantity of heat required to bring the feed water to evaporating temperature, and thus increase the steam production without pushing the fires. With modern arrangements, however, this fundamental idea is no longer apparent.

The oldest feed water accumulator in which the fundamental idea is still clearly expressed, shows to some extent an increase in the water space of the boiler plant (Fig. 1 shows the connections.) The accumulator is connected to the boiler plant by an overflow and a circulating pipe. By means of the circulating pump water is continually supplied from the accumulator to the boilers, and again flows from here back to the accumulator, that is, as much as is not vaporized.

As in the case of a boiler plant without accumulator, the feed water is forced into the boilers by the feed pumps. The water supply, however, is not controlled by the water level in the boilers, but by the steam pressure. If the steam pressure is lowered because the momentary steam requirements are greater than the amount of steam supplied by the boilers, the water supply is decreased; if the steam pressure rises, the water supply is increased.

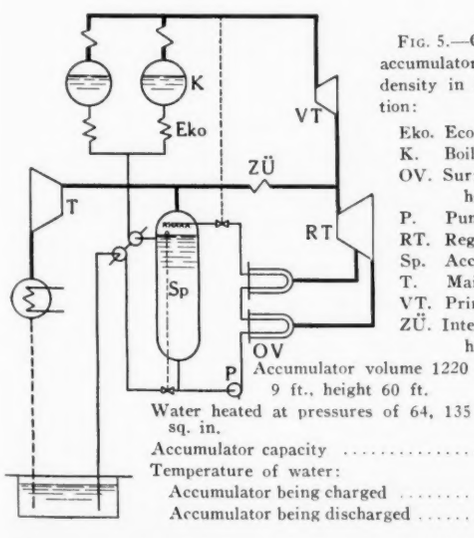


FIG. 5.—Constant pressure accumulator by difference in density in large power station:

Eko. Economizer.
K. Boiler.
OV. Surface feed water heater.
P. Pump.
RT. Regenerative turbine.
Sp. Accumulator.
T. Main turbine.
VT. Primary turbine.
ZÜ. Intermediate superheater.

Accumulator volume 1220 cu. ft., diameter 9 ft., height 60 ft.
Water heated at pressures of 64, 135 and 260 lb. per sq. in.
Accumulator capacity ..... 5000 kwh.
Temperature of water:
Accumulator being charged ..... 400 deg. F.
Accumulator being discharged ..... 125/175 deg. F.

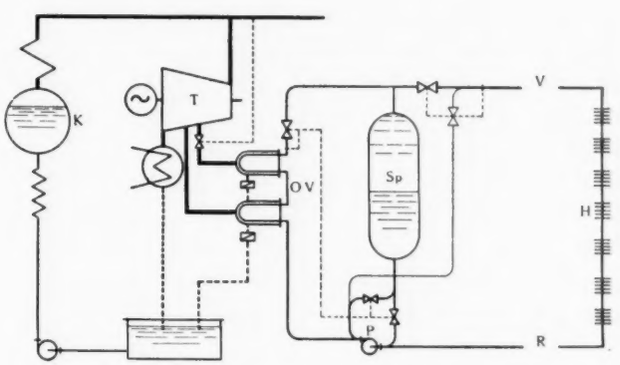


FIG. 6.—Equalization of the load by accumulation in a combined power and heating station.

H. Heating.
K. Boiler.
OV. Surface preheater.
P. Pump.
R. Return pipe.
Sp. Accumulator.
T. Turbine.
V. Feed pipe.

This method of connection is extremely simple and has proved particularly satisfactory in increasing the output and improving the efficiency of old boiler plants without economizers and superheaters. The accumulators are arranged horizontally. Old boilers, *e.g.*, flue

boilers as they lie, can be used as accumulators and the connections can be arranged so that the boilers can again be operated as such at any time.

The connections are fundamentally different in the case of a live steam accumulator (see Fig. 2). In this accumulator also, water at the temperature of evaporation is stored. The water is heated, however, outside the boiler plant by steam taken from the live-steam pipe.

In cases where heat is stored in a water accumulator by difference in density, the accumulator is always either filled completely or up to the same water level. When it is charged, it is filled with hot water and emptied of cold water. If it is partly charged, the upper water is at a higher temperature than that below. When charging the accumulator, hot water is supplied at the top and the cooler water removed from below; when discharging, the cold water supplied below expels the hot water above from the accumulator. Use is made here of the fact that water at various temperatures, because of the difference in specific weights, does not mix but can be accumulated in layers in the same tank. Moreover, during charging or discharging, the distribution of the layers is not altered, since water is a bad conductor of heat.

In the case of a live steam accumulator in actual service the average quantity of steam required by the installation is 15 tons per hour (a numerical example is shown in Fig. 3). The boilers are fired so that in service they would provide this quantity of steam feeding directly from the economizer without accumulator. The temperature of the feed water coming from the economizer is about 230° F. After the accumulating plant has been installed the 15 tons of feed water per hour are injected into the accumulator by the circulating pump through the control valve, and condense 2.5 tons per hour of live steam in the accumulator dome equipped as a direct contact feed heater, so that the water is heated to the temperature of about 394° F., corresponding to a live steam pressure of 227.5 lbs. per sq. in. In the accumulator, therefore, the steam deposited, including the condensate, amounts to 17.5 tons per hour of water at 394° F.

Because of the feed water temperature of 394° F., with the same firing, the boilers can supply a greater quantity of steam than with a feed water temperature of 230° F. The increase in the quantity of steam corresponds exactly to the steam required to raise the temperature of the water in the accumulator from 230 to 394° F.; *i.e.*, 17.5 tons per hour of steam are produced in the boilers and accordingly also the 17.5 tons per hour of water in the accumulator are consumed. Only 15 tons per hour, however, are supplied to the installation, as when working without the accumulator. The accumulator, therefore, does not function as such under these load conditions, which consist to a certain extent of a balance between the steam requirements of the installation and the method of firing. As compared with operation without the accumulator, however, the difference consists in that the boilers are supplied not with water at 230° F., but at 394° F., and accordingly produce a greater quantity of steam than is required by the installation.

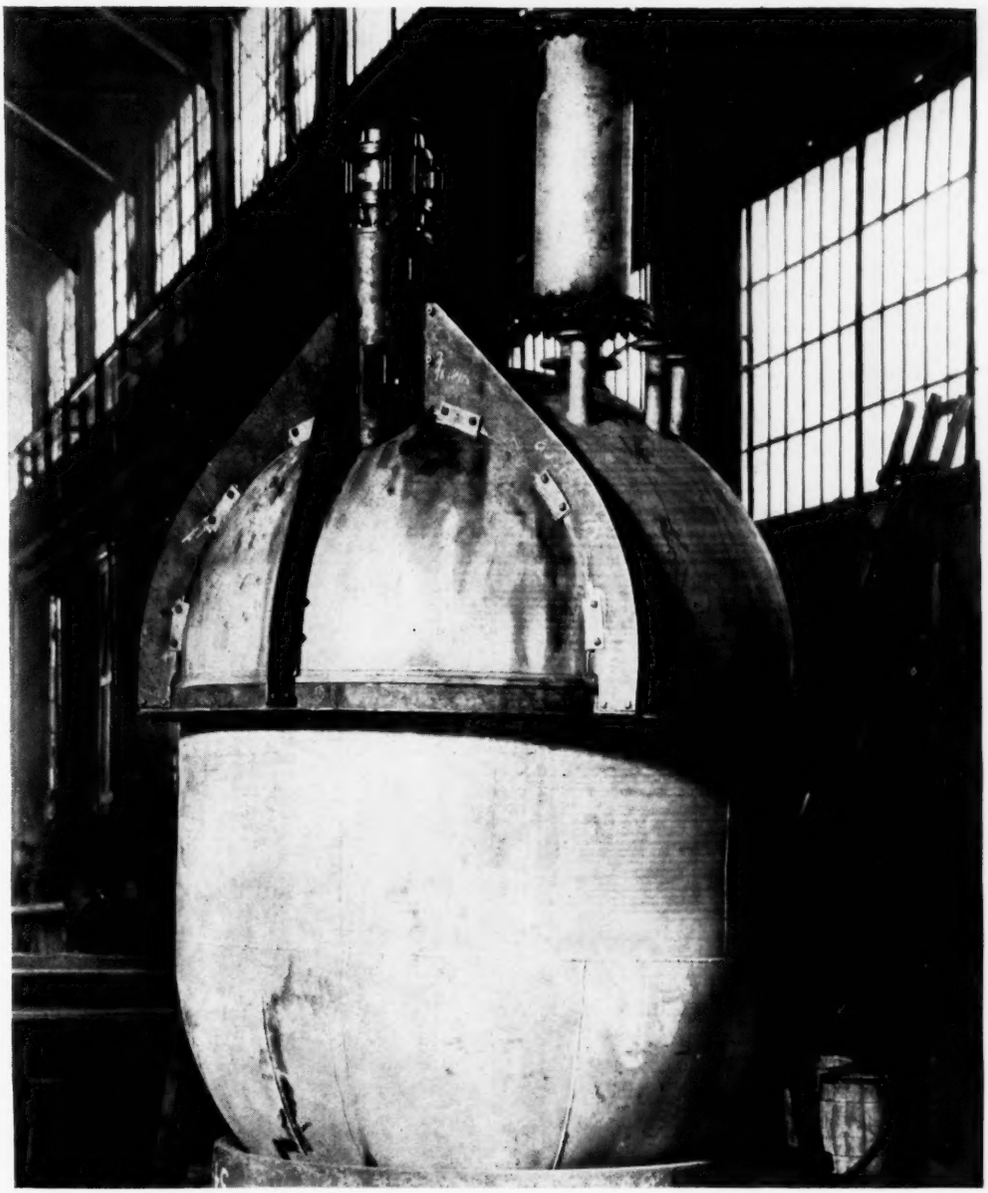
In order to obtain a satisfactory efficiency from the boilers a small constant pressure accumulator plant suffices, since it is today possible to obtain a wide regulation of boiler production not only with gas, oil and pulverized fuel firing, but also with grate firing. The function of the accumulator in this case is not to avoid changes in firing, but only to make the speed with which the changes must be carried out independent of the speed with which the load varies. In this manner the stokers are given sufficient time to adjust the firing to the altered conditions of load. In modern boilers the efficiency is well nigh constant within wide limits of load, so that the value of the load on the boilers does not greatly influence the coal consumption, unless the stoker loses control of the boilers because of sudden and frequent variation in firing.

It is frequently a question not of equalizing the quantity of steam required, but of solving the problem by equalizing the variations in the quantity of steam or heat available. If, for example, gas is available in irregular quantities at a high temperature, which it is desired to utilize in a boiler, the output can be regulated either by means of a gas or a heat accumulator.

In the case of heating by warm water with and without power production, equalization can be carried out by means of a constant pressure accumulator in a very simple manner by inserting an accumulator by difference in density between the delivery and return piping. The temperature of the water delivered is automatically maintained by means of a thermostat by mixing water from the accumulator and return water, and can be adjusted according to the outside temperature. In this manner it is possible to influence centrally the heat given off by the radiators connected, and to attain a saving not only in the heat produced but also in the heat consumption, since overheating of individual rooms due to lack of attendance is avoided.

In some chemical plants a degasifier is arranged in the hot water extraction pipe from the accumulator. The degasification at high pressure is of particular advantage in plants where the additional feed water must be chemically softened. Feed water purified by the lime-soda process contains a surplus of soda, which, with increasing temperature, is decomposed into caustic soda and carbonic acid. If the water is heated in the boiler itself, carbonic acid is also liberated in the boiler; if the water is heated in economizers arranged directly before the boiler, the carbonic acid, provided that sufficient time is available for its liberation in the economizer, is washed into the boilers with the water. If, however, the feed water is heated by steam to as high a temperature as possible outside the boiler plant and time allowed for the reaction to take place in the accumulator, the carbonic acid is already liberated in the accumulator and can be led off from this and from the degasifying plant.

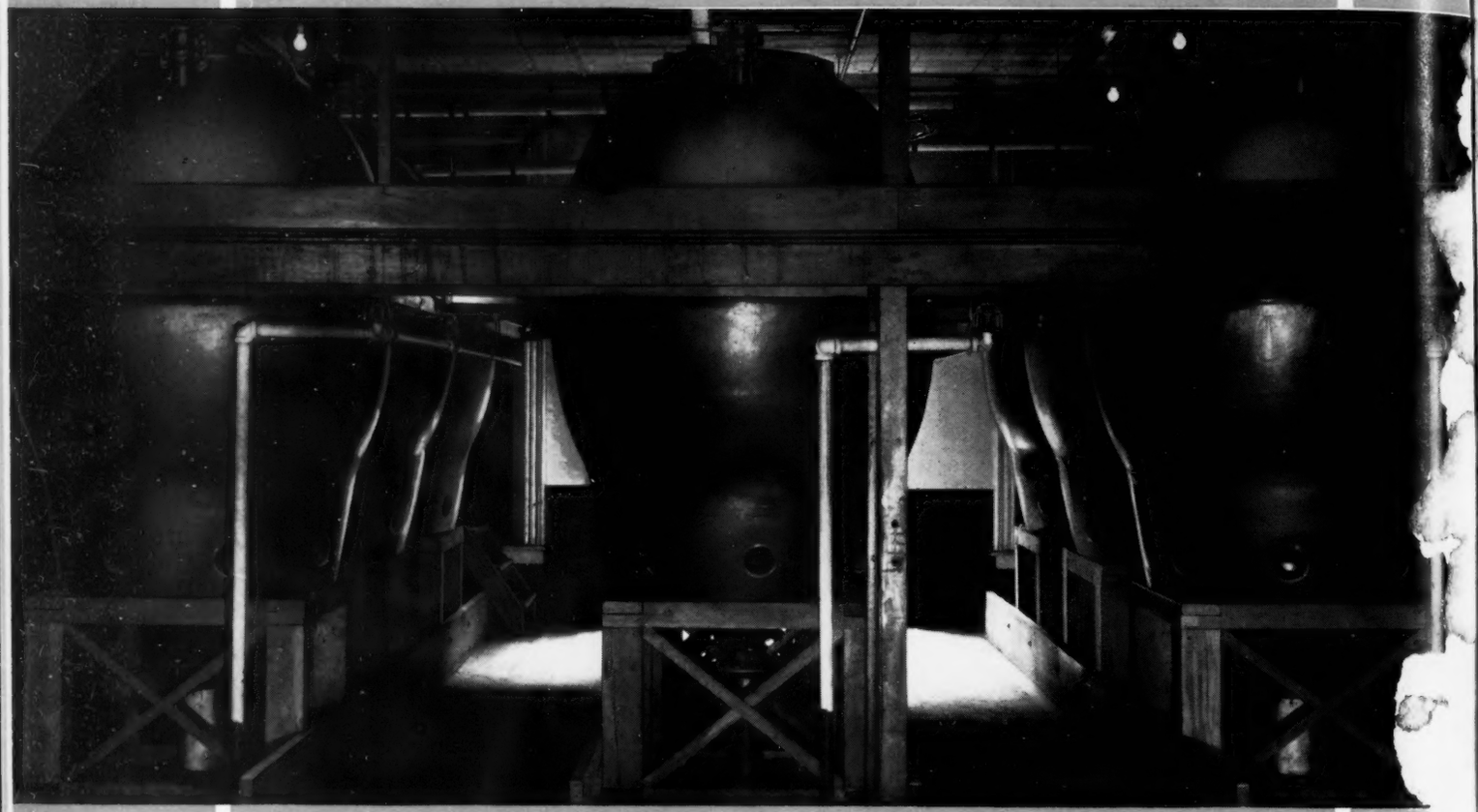
Plant Operation and Administration



Pressure vessel for boiling hydrochloric acid, fabricated of the new Hastelloy A.

A Digest of New Methods and Equipment for Chemical Makers

GENERAL CERAMICS CHEMICAL STONEWARE



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Pitfalls in the Rocky Road of Research*

By Charles F. Kettering

Director of Research, General Motors Corporation

RESEARCH is one of those things which is talked about more and understood less than any other industrial relationship. It is something which if you don't undertake until you have to, it is too late. It is just as though you waited to see the smoke rolling out of a building before calling a fire insurance agent. You have to pay the premiums on insurance for a long time and really hope that you will never need it.

Now the first difficulty that a research organization connected with industry gets into is with the auditors. The bookkeeping gets to be quite a complicated thing, because in any manufacturing organization you have to have detailed costs to set up a budget. So the bookkeeping head wants you to say how much this project is going to cost and how much you will get for it when it is done; and you just can't do that. Consequently, the first thing you must get is a business understanding.

I have taken this point of view with our executives. Treat our research organization as an insurance company. You pay so much a year for the policy—make the amount whatever you want. State the sum you want to pay and we will fit the insurance accordingly. The only thing that we guarantee you will get from the policy is that a sincere effort will be made to keep you up-to-date technically on everything that is going on.

Getting an understanding between the research organization and the accountant in an industry is the most fundamental thing to do if you are going to have peace and quiet and get something done. If the research man is told by the management that he must come under the same rules and regulations regarding the financing of his operations as the rest of the concern, then the only thing for him to do is to take the most easy and obvious problems so that he can meet the forecasts and prices. But if you don't have to do that, then you can go to work and do something worth while Then you can pick some long range problem.

We consider that a research organization is at its best when it has the fewest number of problems, and those of the most fundamental nature. Such problems are hard to solve because it takes time and the patience that goes with time. In the particular organization I am associated with, we divide the work into three classes in order to get things set up right. The first 40 per cent. of our budget is spent on service to our divisions. If a division comes to us and asks us to do a specific thing for them, we don't do it until we make out a purchase order and fix the basis upon which they are to pay us for the work. But if it is a normal operation we do it. The second 40 per cent. of our budget is spent on moderately advanced work—on trying to forecast what the technical difficulties in our business are going to be 4 or 5 years ahead. That leaves 20 per cent. to do research on a few very far-reaching and fundamental problems which will have a great value not only to our organization but to all the industrial organizations concerned. It takes a long time to develop these long range projects. So the most important thing that has to be done in working out the relationship between the University and an industrial organization is to decide how to pick the first problem upon which to cooperate. That is a very difficult job. I know what problem people always like to pick when a new association such as this is formed. It is the certain one that is troubling you and that has been troubling you for a long time, and you would like to call up on the telephone and get the answer. But you can't do that. As I said in the beginning, you have to treat this as an insurance policy and not a fire department.

We are very likely to be most interested in those things which are troubling us most. Sometimes it is a very good thing to take those as specific research problems, but not to put into them the intensity, the speed and push that is needed to get the answer tomorrow. A magazine writer came into my office one day when we were working on non-shatterable glass. We showed him what we were doing and he said, "I don't think this laboratory method is the right way to do this. Over at another company they just ordered them to do it." "Well," I said, "I'll take an even bet with you that we will have an answer three years before they do." All the money in the world and all the people in the world can't solve a problem unless some one knows how. Problems are solved in some fellow's head. They are not solved in a laboratory at all. We got this idea straightened out in that magazine fellow's head, and we gave as an excuse for having so much equipment in our laboratory the simple fact that the human skull is so extremely dense. It does take an awful lot of effort to get a perfectly obvious thing organized in a man's head.

In bringing problems to the University, let's step back away from this front line demand of industry and recognize what the situation is in this way. Let's not put problems here that you'd like to have an answer for tomorrow. For you are not likely to get it. The problem given to the University should not have too much time pressure on it. If I were a research director at the University when you bring in your problem I'd sit down and say to you, "All right, let's start that problem, but let's not start it in a blanket way. Let's say this one particular phase of it would be the most logical thing to tackle first, and that is going to cost about so much money and take about so long a time. As to what the results are going to be, we haven't the slightest idea." Maybe all we will find out after we have gone through with the experiments planned is to decide whether the solution is likely to lie down this road or that road, and we may decide to drive a few miles down one of the roads and see.

No problem looks very difficult when you start. It is only when you get 90 per cent. done that it looks difficult, but you should check up constantly on the progress of the investigation; and, if you see that the research is going to be one of those which take a long time, then you should see that everybody understands that it is likely to be a long one. You should then decide whether if you had the answer it would be worth the amount of money it will cost to get it. But what you must first do, if you are going to get good results, is to search for those problems which are adjusted to your industry and which will have a fairly wide application when you get the solution.

Sometimes the result that you start after proves to be insignificant compared to the by-products. Nobody can predict what the results are going to be, but there is one fundamental rule that we hold to. This is to finish the thing we start to do before we go back and pick up the by-products.

By observation, a failure may sometimes be turned into success through discoveries made in some other field. So you want to be very careful when setting up an experiment, for it's probably going to work out in a different way than you think it will. If you are keen enough on answering why an experiment doesn't work when it fails and follow that through, that is worth more than the experiment itself. Therefore, see the thing through with a lot of patience; otherwise you miss.

The only reason you try an experiment is to cultivate your own thinking. You set up an experiment and it doesn't work. That means you weren't thinking straight. You say the experi-

* Digest of an address before the Industrial Research Conference, Ohio State University, Nov. 6, 1936.

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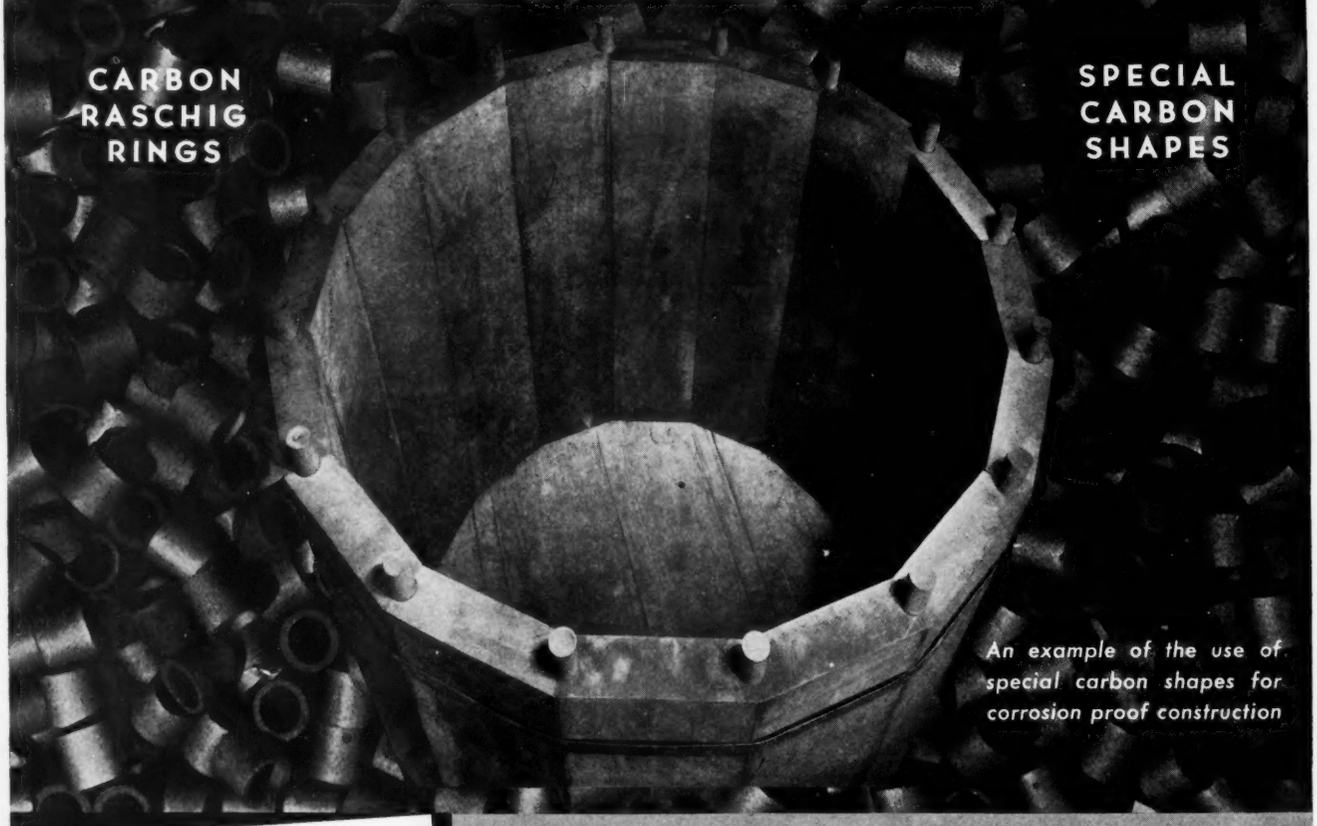

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ment failed. That is just your alibi. That was not it at all—it was your own thinking that failed, not the experiment.

So the experiment that fails is simply an experiment in which you were wrong. Now if you don't find out why you were wrong, your next experiment is going to be worse than the first. Remember that an experiment is an impartial judge of your thinking. You may get all fussed up and use bad words. But you made the experiment, so why should you call yourself bad names? Very few problems will permit of a thoroughly logical analysis. Most of the things that are difficult are not that logical. Consequently you must use whatever method you can use, such as mathematics, chemistry, or anything that will produce a definite set of conditions with which you can experiment. It takes the same amount of energy to do an experiment whether it is an advanced experiment or whether it is an elementary one. Such an analysis is very, very important, for just trying one experiment after another doesn't necessarily mean that you are getting any place at all.

Discovery of Extreme Pressure Lubricants

You will hear, or perhaps have already heard, of the materials known as extreme pressure lubricants, which are being used quite generally in certain parts of automobiles. I will tell you a story about extreme pressure lubricants. We have been working with lubricating oil for a great many years because it is a very important factor in cars. We have always been suspicious that we didn't know how a lubricant works. We had occasion to do some work in connection with rear axle gears in Canada. Over there they have a lot of snow during the winter and they would come along and scrape the roads, making a one-way track. Two men would meet and stop to talk. One would drive off one side of the road and the other off the other side so that each would have one rear wheel in the snow and one on the pavement. When they started to go, each would spin the wheel that was in the snow and after a while the differential gear would pick it up and get going, but they didn't know that in getting started they had ruined their axle. That happened so often that it became a very acute problem and it was brought to the research laboratory. We studied it, recommended a suitable change, and they went ahead about their business.

After a while I said "Why don't we take the same machine we used in studying that problem and go back and study lubrication from this standpoint? Suppose that your worst enemy was in a race with you, and you had been appointed to select the worst lubricant in the world that you could select for his car. What would you select?" Finally one of our men, a chemist, said that he would select dichloroethyl ether which was a material that if you poured it in your hand it would evaporate. Compared with lubricating oil, that liquid had absolutely no body or viscosity. So we set up our testing machine and put in it the best lubricating oil it was possible to find, and the story was that when you had added a load of 6000 pounds on this particular testing machine the bearing would stick up. We then cleaned it out thoroughly and put in the dichloroethyl ether. We had made various bets. One fellow had said that he would bet the bearing would stick at 300 pounds, another at 400 pounds, still another at 500 pounds. Remember, the oil had carried it to 6000 pounds. It was all a foolish experiment, anyhow, so we went about it very gently and deliberately. We added one weight after another. To make the story short, we ran out of weights at 30,000 pounds and the bearing did not stick.

Now out of that work has come the whole theory of extreme pressure lubricants, in which you can do things with lubricants and ordinary material that you never thought it would be possible to do at all. Remember you ought always to have a theory and be perfectly positive as to what the work calls for, so as to know that it is proceeding in the right direction anyhow; and, even if you are mostly wrong as to the theory, the more nearly right you are the quicker you will get the correct results. I am giving you all this as an illustration of the fact that you sometimes experiment in the opposite direction to what you expect.

We say intelligent ignorance is the first requirement in research. Try an experiment and do it step by step, and if you persevere, it will lead you to where the most trouble is. So the thing will come around to a pretty logical conclusion.

We have a lot of fine thinking people here at the University. But you can't give them a problem in which you are interested and expect them to analyze it from the particular standpoint of your own business, because they can't do it. Here is one of the greatest difficulties in commercial or industrial research. The way to do is to get a group of chemists and physicists and put them into suitable rooms. The next logical thing to do is for you to write down ten things that you would like to have fixed or that you would like to know something about. You will always put the hardest one first, but somewhere down the line you can pick out a problem that would be of the right character to put into the organization here—one that is a definite sort of problem, one which has a direct bearing on your business, and one which has not too much time pressure. Now when you get that problem solved you will be surprised at how much influence it has on the others. It's just like a cross-word puzzle. You will go from one word to another.

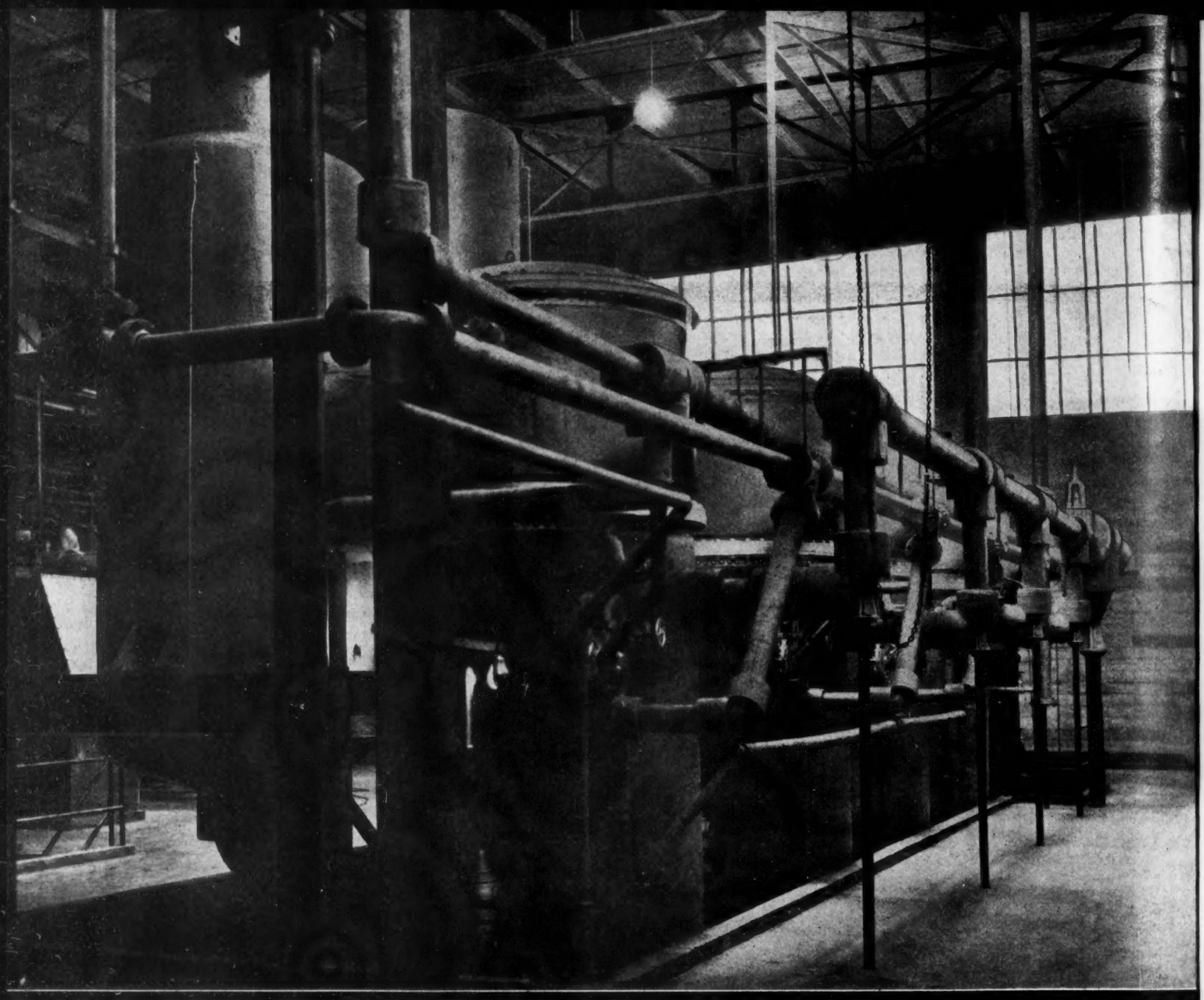
It is important for the industrial man himself to make a thorough analysis of just what his problem is. If someone could tell you exactly why something can't be done that is usually a problem that can be solved, for you have an analysis of what the difficulty is. But sometimes the problem is stated no more concretely than that something isn't working well. "Why isn't it?" "Well, it just doesn't work." Such an abstract problem is not nearly so good to bring to the University as a more specific one.

Do Not Take Negative Research Reports

In research you must not take a negative report. A friend of mine was telling me the other day about a fellow who was trying to glue a little piece of leather on a piece of aluminum; so he set aside a certain period each day to work on that problem. Finally, one of the glue experts came around. He said, "Sure, we will undertake that work." He worked on it for two or three months, and reported back: "There isn't a thing in the world that will make leather stick to aluminum." "That is funny," said my friend, "I have been doing it for two months now." If you have to have a thing done, don't take the experts' opinion. Be patient!

So if I have one thing to say here, it is this: Let's work out our first problem very carefully. Let's experiment on how to work together; and, if we should fail on that first problem, let's remember that it is only our first problem, and therefore just an experiment. Let's analyze matters and find out why we failed. There is so much we don't know. In fact, we know so little, if you want to put it that way.

Let's look at it this way. Assume that the various products of your business are contained in a basket which may be called your work basket. Assume that some of the things in that basket are going to fall out in two weeks from now, and that you are going to have to put something else in. You are going to lose continually out of this basket and you must keep putting other things into it. Because time alone produces this change, you have to keep in step with time. So the perfectly balanced industrial research program is one which is absolutely based upon the unit of time. If you get too far behind the times you go broke that way, or if you get too far ahead of the times you can go broke that way. If you sit on the side of the road you lose out. But you know very well that you are not going to be making the same product three or four years from now.



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BUFLOVAK EVAPORATORS

At one of the meetings held on the occasion of the twenty-fifth anniversary of the Buick Motor Car Co., someone said that no matter how long the industry continues they would never make a better car than that one. So, being the last speaker, I had to say something to offset that idea, because it was against my business. So I said, "Here is the chief engineer, the works manager, and the chief inspector. If anybody in the world is able to pick out a good car, they ought to be able to do it. So let's ask them to pick out the best car they can and put it on a table in a glass case and seal it up air-tight, so that whenever it is taken out it will be just as good as it is now. Paint on the side of the case the price of the car. To make calculation easy, let us set it at $2,000. Let us come back here a year from now and look at that car. It does not look quite so good as it did a year ago, and we think that the price of $2,000 is just a little high—even those enthusiastic salesmen do not think they can sell it at $2,000. "What do you think it is worth?" They say, "$1,800," and we put that on the outside of the glass case. The next year we come back, and the $1,800 is too high, so we write $1,600, and the next year we write something lower still. At the end of ten years nobody but the junk man will set a price on it, even though it is as perfect a car as it was the day we put it in there. Did the car change? No. That car certainly did not depreciate, because that was the premise of the experiment. What has happened? The eyes on the outside looking through have changed. Values do not exist in material; they exist in the minds of the people who are going to buy.

That is true in every process we have, in everything we manufacture. The minute a product is standardized and ceases to change, then it begins to fall behind the procession of progress. Good economists will tell you that. But before you move you ought to know where you are going. Research is the only way to find that out. And industrial research works the best when you don't know you are doing it.

Acetic Acid Concentration

Several methods have already been proposed for concentrating acetic acid in aqueous solutions. One of these methods, which was described in 1884 by Goering consists in extracting the acetic acid in liquid phase by means of low boiling point solvents such as ethyl acetate, ethyl ether, amyl alcohol and the like, the said solvents being then separated from the acid by any usual distillation process. Experience shows that this method leads, without laying undue importance on the extraction material, to the use of quantities of solvent which are equal to several times the volume of the solution to be exhausted, the subsequent evaporation and dephlegmation of which require a considerable consumption of heat.

Other methods consist in treating the water and acid mixture in the vapor phase in a column by a suitable 3rd body acting as a solvent for the acid. Among such processes, particular mention is made of concentration by azeotropic methods, in which the 3rd body plays the part of a water carrier and which requires the complete vaporization of the diluted solution and of the carrier.

A process for concentrating aliphatic acids has been proposed in English Patent 399,529 by partially concentrating the dilute acid by means of an organic solvent capable of acting as an extracting agent for the acid and boiling below the boiling point of the acid, then at least partially separating the extracting agent from the acid, and further concentrating the partially concentrated acid so obtained by removal of water in the form of an azeotropic mixture with a further organic liquid. In this method the extracting treatment forms the first stage of the process and the evaporation of the extracting solvent to separate it from the extracted acid does not entrain the remaining water as an azeotropic mixture, such water being subsequently separated from the acid by the vapor phase treatment.

The process according to the present invention is one in which treatment with a solvent in liquid phase and treatment in vapor phase are combined in series or in parallel, and in which the extracting solvent is a liquid which forms an azeotropic mixture with the water, from which the water can separate at least partially as a layer, the extraction with the solvent following the vapor phase treatment when the two treatments are applied in series, and the heat set free in the condensation of the product of the vapor phase treatment being employed in the evaporation required in the extracting treatment.

The invention may be carried into effect by distilling one part of the solution to be concentrated in the presence of a third body; and by treating the other part in a liquid state by means of a solvent capable of forming with water a mixture of minimum boiling point, the vaporization and the dephlegmation of the said solvent being ensured in part by the heat which is available at the top of the distillation column which serves for the treatment of the first part of the solution.

Suitable solvents for the liquid phase treatment, when the process is carried out at atmospheric pressure are low boiling point liquids such, for example, as methyl propionate, ethyl acetate, isopropyl, and propyl ethers or mixtures of such bodies. When the vaporization of the extracting solvent is effected at a pressure which is lower than the pressure of the treatment in the vapor phase, solvents having higher boiling points may be used.

The vapor phase treatment may consist in a distillation by an azeotropic method in which case the substances which may be used as water carriers are, for example, butyl acetate, mesityl oxide, light wood oils, butyl alcohol, amyl alcohols, ethyl butyrate or mixture of these substances, or other substances capable of forming with water constant boiling mixtures, the condensation temperature of which at the pressure at which the treatment is effected is high enough for producing the vaporization of the solvent serving for the extraction of the acid in the liquid phase.

The process may likewise be applied with dehydration of the acid in the vapor phase effected in the presence of a heavy solvent of the acid, more particularly such as heavy wood oils, the vapors which are produced at the top of the dehydration column—and which are then formed almost exclusively of water vapor—being used as before for vaporizing the light solvent which has been used for the extraction in the liquid phase, while the heavy oils charged with acid are subjected to distillation, so that the acid is separated from them.

In the case when the process is applied to the concentration of a solution of impure acid, such, for instance, as crude pyroligneous acid produced in the distillation of wood, the whole of the solution to be concentrated may be used in a preliminary distillation in the course of which it is freed from the non-volatile impurities, the condensed mixture containing the whole of the acetic acid of the original solution being removed at a suitable point. English Patent, 456,921 of 1936, Societe des Produits Chimiques de Clamecy and Etablissements Lambiotte Freres, Nievre, France. Digested in British, *The Chemical Trade Journal*, Jan. 8th, '37.

Petroleum as a Chemical Raw Material

Petroleum will always remain the source of fuel for internal-combustion engines and for steam raising. Its use as a source for chemicals will necessarily be small in proportion, but, nevertheless, essential to industry. As time goes on, it becomes more necessary to contemplate manufacture of synthetic products from petroleum.

We see in petroleum far greater possibilities than in coal tar, inasmuch as the whole range of aromatics can be made from it, as well as derivatives of the paraffin and olefin series, far exceeding the quantity obtainable from coal tar. Dr. A. E. Dunston before the Society of Chemical Industry and Institution of Petroleum Technologists, *The Petroleum Times*.

Maintenance of Autoclaves

By V. A. Yardley

THE operating conditions of autoclaves in industry cover a very wide range; pressures may vary from a few pounds to many hundreds per square inch, and temperatures may reach 300° C. However, chemical attack may present extremely diverse corrosion problems. In order that running and maintenance costs, which are largely governed by the initial design, may be kept down, it is necessary that the plant should be easy to dismantle, be provided with proper means for removing heavy parts and possess adequate room for working without causing any interference with the running of the other equipment. This will be most important where conditions of service are likely to be severe as in the case with autoclaves and other high pressure chemical equipment. It should be appreciated also that maintenance costs are closely related to the value of the plant installed.

Most autoclaves are constructed of steel and, if required, are lined with materials, chosen as far as possible for their resistance to chemical attack, such as aluminum, copper, lead, nickel and its various alloys, glass and enamel. The use of such linings is in general expensive and where the pressures and temperatures in the autoclave are relatively low such equipment is often constructed solely from the above metals.

This principle applies also to the various parts such as the agitator, thermometer pocket, pressure gauge fittings, dip-pipes, manhole and filling covers, and the various cocks and valves.

It will be manifest therefore, that autoclave equipment is more expensive to make than ordinary chemical equipment mainly because of the cost of the special materials used, the particular methods of fabrication employed and the better class of workmanship required for its construction.

For these same reasons upkeep charges will be at a much higher rate than they will be for ordinary chemical equipment and if long life with minimum maintenance costs are to be envisaged then due attention must be paid to reducing the wear and tear.

This can be effected by ensuring definite and popular methods of operating and by defining responsibilities and duties of the process and maintenance staff. It is suggested, therefore, that process staff should regulate, but not repair, and that the maintenance of autoclaves be undertaken by the mechanical staff. In the ordinary type of chemical equipment it is often possible and sometimes more convenient for a process operative to do his own servicing, but with plant so specialized as autoclaves it is better that the servicing should be done by staff more highly skilled in such work. This argument may be illustrated by reference to the adjustment of the agitator packing gland. The surface of a rotating shaft is very liable to damage and maladjustment of the gland may therefore result, not only in damage to the shaft, but also to the loss of a batch through enforced shutting down.

In the routine maintenance of autoclaves great care is essential in the choice of the packing for the gland of the agitator shaft. Coarse or harsh packing is undesirable and flaked graphite greases should be used with caution, as the edges of the graphite flakes are sharp and hard and may quickly spoil the surface of the shaft. Particularly suitable are the various flexible white metal packings and those which consist of a series of white metal and leather rings, especially if arranged to be lubricated by oil under balanced pressure. For the leather packing, ordinary scrap leather belting soaked in tallow may be used. Packings should not be permitted to become hard and should be renewed frequently in order to forestall gland failure. It is also a good practice to fit an adjustable hood on the shaft, immediately above the gland in order to prevent dirt or chemical materials from entering the gland and so damaging the shaft. For filling, washing and blowing-over operations, plug-cocks are better than globe or gate valves, as they provide free flow for the liquid while their working faces are protected from erosion. The older type of plug-cock is liable to stick and the usual remedy of hammering is always a dangerous practice. The newer types of lubricated and sleeve-packed cocks have overcome these difficulties and since they are made in a variety of materials and are designed for all pressures, their use on autoclaves is to be recommended.

For regulation of pressure and flow however, other types of control are more suitable. The ordinary conical seated valve does not lend itself to economical service, for when partially opened and the fluid velocity is high, erosion of the valve and seating takes place. For such purposes the piston-type valve, although subject to erosion trouble, gives much longer service, providing any incipient leaks are skillfully remedied.

In high pressure valves, trouble with gland packing is often noticeable, due usually to slight corrosion of the valve stem. This can be avoided if a spindle of non-corrosive alloy is used such as Monel or austenitic steel.

The covers and other fittings attached to an autoclave are best connected by flanged joints generally of the spigot and recess type Such joints give satisfactory service if, when remaking the connection, precautions are taken to ensure that the joint faces and the gasket are clean This is particularly important when metal gaskets are employed.

Copper is often used as a jointing material and with care such a gasket can be used many times before renewal, but it must be borne in mind that the copper work-hardens during compression and so it is preferable to anneal the gasket before remaking the joint.

For service on autoclaves only those pressure gauges should be used which are fitted with steel Bourdon tubes, since those of bronze are in many cases inadmissible, for example, when ammonia is present. It is advisable to ensure that all persons handling the equipment are aware of this, because although it may seem an elementary precaution, such things can easily be overlooked in the hurry of replacing a faulty gauge.

Autoclave linings can be easily spoiled and when the effect of a new method of processing is in doubt, it is better, first of all, to have a trial run in a laboratory autoclave. An example of this may be given in the amination of organic compounds by the use of ammonium chloride. The lining has to withstand not merely the action of the ammonium chloride and the organic materials, but also the hydrochloric acid formed by thermal dissociation of the ammonium chloride. At temperatures in the region of 320° C. the pressure will be about 60 atmospheres if a silver lining be employed, but when an 18/8 type steel is used as the lining it is attacked by the liberated acid and the pressure may rise to over 100 atmospheres due to evolution of hydrogen.

Where prevention of corrosion is not practicable the lining may in certain cases be preserved by a judicious selection of materials for the other parts of the autoclave, whereby attack may be diverted to those parts easily renewable such as the blades of an agitator or the protective housing for a thermometer pocket, such portions being more heavily built to allow for this wastage.

Autoclaves should be fitted with a safety valve or other equally efficient means of releasing abnormal pressures. Unhap-

pily, the safety valve is always a potential source of danger, which its substitution by a bursting disc does not entirely eliminate, since both valve and disc can become easily choked with material and so fail to operate. The fact that it is seldom necessary for such reliefs to function, gives a false sense of security and in all cases where choking is possible, such reliefs should be dismantled and cleaned at regular intervals, if need be at the end of each run. To facilitate such cleaning, safety valves should be of robust construction and capable of being readily dismantled without disturbing the valve setting. It is not possible always to keep fully occupied every autoclave in a works, and when laying off an autoclave, it is a good policy to make sure that, after the usual cleaning and washing out, the autoclave is kept as dry as possible, for example, by placing a tray of quicklime inside. It is desirable also to remove the packing from the agitator stuffing box and refill it with grease. This practice will avoid the troubles consequent upon the employment of aged packings, which are frequently overlooked in the hurry with which such equipment is brought back into service.

In view of the fact that autoclaves have to withstand high pressure and are subject to deterioration it is essential that all possible steps should be taken to ensure safety in operation. This can be secured best by periodic examination, which should include visual inspection, observations of any change in structural dimensions and an hydraulic test to the maximum pressure for which the plant was designed. The results of these examinations should be recorded in the log-book which should be used for recording all details of maintenance, arranged in sequence with the process-log, so that the full history of the equipment is available. *The Chemical Age*, British, Feb. 13, '37, p134.

Methods of Particle Reduction

In the preparation and manufacture of many chemical products the raw material must be reduced to a state of fine subdivision before use, and in numerous instances it is desirable that the finished article be marketed in the form of a fine powder or paste.

The reduction of a material may be accomplished either by crushing and splitting, or by cutting and tearing. Such operations are usually referred to as "grinding," but as the term is a general one embracing many functions, such as the shaping of metals by the surface application of abrasives, and the "lapping" of engine cylinders, when applied to the chemical and allied industries its use is interpreted as "size reduction." There are but very few branches of the chemical industry where this size reduction, in one form or another, does not play an important part, and the plant available for this purpose is of wide variety.

Grinding machinery is generally divided into three classes, namely, those in which the material is crushed or coarsely ground, those which provide a finely pulverized product, and those which produce the materials in the form of paste. Among the machines used for crushing very hard materials the most simple and inexpensive is the "jaw crusher." This type of machine performs its operation by cracking or crushing the material between a pair of heavy steel jaws, one of which is fixed and the corresponding or "working" jaw is caused to apply pressure against it by means of a cam operated reciprocating motion. There are numerous modifications and refinements of this type of machine, some of which have a movable jaw pivoted at the top, thus giving the greatest movement to the smallest lumps, and others are provided with a movable jaw pivoted at the bottom, which enables the largest lumps to be given the maximum movement.

Other machines used for coarse grinding are crushing rolls, ring roller mills, rotary crushers, swing-hammer crushers, and gyratory crushers. Machinery of this type performs its task by the application of continuous pressure, which may be applied either directly, or by centrifugal force as in the case of ring roller mills. These machines are nearly always employed for the reduction of hard or semi-hard materials of large size, such as ores, phosphate rocks, limestone, and coal.

In the second class, reduction is effected by means of blow or impact, and the machinery used includes stamp mills, ball mills, tube mills, pebble mills, and attrition mills. The most generally employed and useful are the ball mills and pebble mills. These machines consist of a cylindrical, conical, or spheroidal shell, rotating on a horizontal axis, and charged with the grinding medium which may be steel balls, flints or pebbles of either regular or irregular shape. Some mills of this type are "wind-swept," that is, a strong current of air is continuously passed through the mill to remove the finer particles as they are ground; others are fitted with means for continuous feed and discharge. Ball mills and pebble mills are used for both wet and dry grinding, and also for mixing enamels, fertilizers, etc.

There are certain materials which it is extremely difficult to grind, particularly those of a soft or resilient nature, examples of which are to be found in certain drugs and seeds, flour, pigments and clays. Such substances are ground and mixed in edge-running mills and buhrstone mills. The latter, used for grinding flour and cereals, is the modern adaptation of the old millstones.

Finally, there are the colloid mills, and homogenizers. Machines of this type are used to reduce materials to a condition of extreme fineness or, as the name implied, a colloidal state. Such mills are obtainable in various forms and designs, but in all, the operating results depend upon the speed of rotation and the grinding area.

In the selection of grinding machines it is necessary carefully to consider several important factors, first and foremost of which is the nature of the material and its intended purpose. Some materials are sensitive to temperature changes, others have a tendency to agglomerate; many chemicals are unstable, and an excessive rise in temperature may cause them to ignite or explode. Efficiency in all grinding operations is largely determined by the size and particle shape of the feed, as well as that of the finished product, and by an intimate knowledge of both the physical and chemical characteristics of the material to be reduced.

In order to facilitate the selection of suitable equipment, most manufacturers invite potential purchasers to submit samples of their material for "test" grinding, together with a specification of their requirements. *The Chemical Age*, British, Dec. 19th, p.525.

Compressibility of Gases

A new method of determining compressibility of gases has been developed by the Bureau of Mines, in the laboratory at the Amarillo, Texas, helium plant. Method has been described by E. S. Burnett in a paper, Compressibility Determinations Without Volume Measurements, delivered before the American Society of Mechanical Engineers and published by the Society in the December, 1936, issue of the *Journal of Applied Mechanics*.

Production of Higher Aldehydes

Processes by which satisfactory yields of higher aldehydes can be obtained from the corresponding higher fatty acids have been developed by chemists of Armour & Co. The methods are based on the discovery that vaporized higher fatty acids will react with formaldehyde in the presence of a catalyst to give significant yields of aldehydes. Reaction is facilitated by the presence of carbon dioxide and steam in the reacting mixture, although these substances need not necessarily be present.

Carbon Black From the Monoxide

Carbon black obtained by the decomposition of carbon monoxide using iron-containing catalysts is freed from iron, particularly in the form of iron carbide, by treatment with chlorine, hydrogen chloride or mixtures thereof, which may be moist, at the temperatures between 400° and 1250° C. Preferably the carbon black is scattered through a uniformly heated stream of chlorine, etc., moving in counter-current and final removal of chloride and adsorbed chlorine is obtained by spraying through an inert gas atmosphere, *e.g.*, hydrogen or nitrogen, with the addition of steam if required. The impurities (up to 6%) may be reduced to about 0.1%, and the product is suitable for use in the printing ink, lacquer or rubber industries. English Patent 456,252 controlled by Bayerische Stickstoff-Werke Akt. Ges., Berlin.

Soya Bean Oil Extraction Using Alcohol

Soya bean oil is being extracted by an alcohol process in an experimental plant of the Manchurian Soya Bean Co., a subsidiary of Mantetsu. The beans are boiled in alcohol, the liquid is cooled, and the oil is separated. The alcohol which takes up much of the water from the beans, is then distilled. If the chlorides can be separated from the liquid, it should be possible to regain 99.8% absolute alcohol. British, *The Chemical Age*, Feb. 13, '37, p151.

New Synthesis for Anisic Alcohol

A new synthesis of anisic alcohol, developed in France, involves condensation of anisole with formaldehyde followed by esterification and saponification with alcoholic potash. British, *The Chemical Age*, Feb. 13, '37, p151.

Citric Acid from Molasses

A recently patented process in France for the manufacture of citric acid from molasses is based on the discovery that salts of uranium, manganese and zinc influence the growth processes of citric plants so as to give a high yield of citric acid. It is also claimed that the organism formed by crossing *Mucor priformis* with *Aspergillus niger* gives a better yield of the acid than either organism alone. The former organism is found in pears and apples; the latter, in gall apples. British, *The Chemical Age*, Feb. 13, '37, p151.

Potassium Sulfate from Salt Brines

A professor at the Tokyo Imperial University is said to have obtained a patent for a process of treating residual salt brines with aluminum sulfate to yield a commercial potassium sulfate, the aluminum sulfate being recovered for further use. Dept. of Com., Bureau of Foreign and Domestic Commerce.

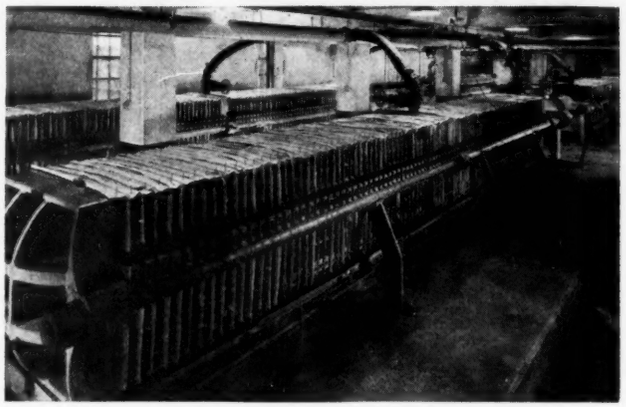
Non-Deliquescent Synthetic Urea Fertilizer

The Showa Fertilizer Co. of Japan has announced the successful development of a process for a non-deliquescent synthetic urea fertilizer material by treatment of synthetic urea derived from ammonia and carbonic acid gas with gypsum.

Flash Distillation of Crude Tar

Standard methods of distilling crude tar have been shown to be wasteful in fuel, to require an excessive amount of equipment, and to produce high yields of residues which are almost invariably cheaper than the distillates. Systems of flash distillation, especially when combined with efficient fractionating devices, reduce fuel and operating costs, eliminate unnecessary re-running of the crude distillates, and preserve the tar from serious decomposition. The nature of the residue can be varied by control of furnace temperatures and of the distillates by tapping side-streams from selected sections of the column. As, further, the operation is continuous, the products are always under control and their uniformity assured. Development in Coal-Tar Distillation, by Dr. H. G. Shatwell, *Chemistry & Industry*, British, Feb. 13, '37, p155.

PROFIT-MAKING



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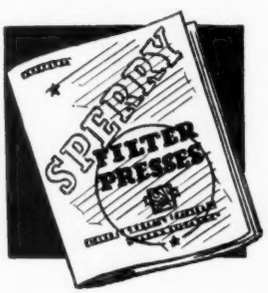

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Booklets & Catalogs

Companies whose booklets are reviewed on this page will be glad to supply readers of "Chemical Industries" with copies free, provided this magazine is mentioned and the request is made on company stationery. Your business title should also be given.

The American Agricultural Chemical Co., 50 Church st., N. Y. City. A very attractive, beautifully illustrated 56-page booklet describes the long list of industrial chemicals produced. The physical and chemical properties, grades, containers, uses are given in each case. Consumers of industrial chemicals should have a copy of this valuable booklet for ready reference.

The American Cyanamid Co., 30 Rockefeller Plaza, N. Y. City. The March-April issue of "American Hortigraphs and Agronomic Review" is ready for distribution.

J. T. Baker Chemical Co., Phillipsburg, N. J. Each month this unique magazine contains contributions on subjects dealing with the problems of research and control chemists. Various laboratory suggestions and time-saving methods are given.

W. H. & L. D. Betz, 235 Wyoming ave., Philadelphia. The ever-growing interest in the subject of water correction, and the desire on the part of engineers and executives to know more about the chemistry of water correction, can be seen in the printing of a 3rd Edition of "Water Analysis, Methods—Chemicals—Apparatus" (revised to Oct. 1st, 1936).

The Davidson Commission Co., Utilities Bldg., 327 S. La Salle st., Chicago. Each year this well-known brokerage company issues a booklet supplying the high and low price records of fats, oils and packinghouse by-products.

E. I. du Pont de Nemours & Co., National Ammonia Division, Frankford P. O., Philadelphia. L. H. Brandt of the technical department has compiled a very valuable service booklet on "Ammonia in Petroleum Refining."

Electro Bleaching Gas Co., 60 E. 42nd st., N. Y. City. "The Pioneer," a very interesting house organ of both EBG and Niagara Alkali, is available monthly to those who would like to receive it.

Fritzsche Brothers, Inc., 76 9th ave., N. Y. City. The February price list of this well-known essential oil house has been released.

General Dyestuff Corp., 435 Hudson st., N. Y. City. A beautifully illustrated brochure shows the spacious and well-equipped new home of GDC.

Industrial Chemical Sales Co., 230 Park ave., N. Y. City. "Taste and Odor Control" (new monthly house organ) contains an article on "Taste and Odor Control In Flooded Areas," written by J. P. Harris of the Chicago office of the company.

The Koppers Co., Koppers Bldg., Pittsburgh, Pa. A 70-page handbook containing complete tables and useful general information relative to the use of Tarmac for road construction and maintenance, has just been issued for free distribution by Koppers' Tar and Chemical Division. Book also contains a discussion of methods and advantages of soil stabilization with Tarmac, condensed specifications for various methods of using road tars, and tables of data not previously issued in handbook form. There also is a list of other Koppers products for the highway and public works field such as crack filler, paving pitch, traffic marking paint, dampproofing and waterproofing materials, old style pitch and approved felt for roofing, linoleum, Grade 1 creosote, koleener, weed killers, disinfectants, municipal incinerators, Fast's couplings, fire hydrants, water works gate valves, dam gates, treated timber, American hammered piston rings, gas holders and welded and riveted pipe.

The Koppers Co., Koppers Bldg., Pittsburgh, Pa. A new folder for ready reference gives an alphabetical index of Kopper products, a complete list of the Koppers associated companies and what each one makes, and a geographical index of all Koppers offices by cities.

Mallinckrodt Chemical Works, St. Louis, Mo. The February price list contains several important changes in quotations.

Pennsylvania Salt Manufacturing Co., Philadelphia, Pa. Publication of a manual on the properties and methods of handling Perchloron, an anhydrous chlorine product, in water purification, swimming pool sanitation and sewage treatment has been announced. Data and information regarding typical applications of Perchloron in the sanitation field are covered in the text and illustrations, with inquiries invited on special applications and problems. Publication is designed for distribution to industries, institutions, and state and municipal water and health departments.

Rolls Chemical Co., Ellicott Square, Buffalo, N. Y. "Retorts," the monthly house organ of this well-known distributer, has been greatly enlarged and its scope widened.

Schimmel & Co., 601 W. 26th st., N. Y. City. The 1936 edition of the annual Schimmel & Co. "Report" has just appeared and is as usual full of useful information. This is no light superficial volume for the layman but rather a handbook of solid facts, encylopedic in its usefulness. The first of the report is devoted to commercial notes and scientific data concerning volatile oils, giving considerable practical information including tests and treatments, methods of manufacture, state of the market, statistics, old and new sources of origin, and innumerable other interesting details.

In another section there is an interesting discussion of four pharmacopoeial works, the Pharmacopoeia of the U. S. (U.S.P. XI), the British Pharmaceutical Codex 1934, the National Formulary (N.F. VI), and the Hungarian Pharmacopoeia IVth edition. The latter is apparently a remarkable document judging by some of the provisions mentioned in the Schimmel Report.

Chemical preparations and drugs are reviewed with interesting highlights on recent developments concerning each of the listed products, and a number of export, import, and general market statistics are given. The information concerning adulterations and falsifications of oils recorded is suprising, quite a number of these being mentioned.

The report contains the usual summaries of scientific publications and patent specifications, invaluable as a digest of the latest news published here and abroad on a variety of subjects important to the essential oil industry. There is a nominal charge for this report.

Automatic Switch Co., 154 Grand st., N. Y. City. A 32 page catalog (No. 20) describes solenoid valves for automatic and remote control for steam, gas, liquids, and air.

Baldwin-Southwark Corp., Philadelphia. The February issue of "Baldwin-Southwark" discusses the facilities owned by the company which makes possible the fabrication of highly diversified and special products and equipment for the chemical and process industries.

The Bristol Co., Waterbury, Conn. The new recording round-chart potentiometer known as the Pyromaster, recently announced, is described in bulletin No. 482. In this bulletin will be found drilling dimensions, chart lists, and other engineering data pertaining to the Pyromaster in the following forms: pyrometer, tachometer, resistance thermometer, millivoltmeter, and milliammeter.

Chase Bag Co., 309 W. Jackson Blvd., Chicago. "Bagology" is a monthly house organ which is highly amusing, instructive, and incidently reports on what is new in the way of Chase bags and new applications and uses.

Fisher Scientific Co., Pittsburgh, Pa. "The Laboratory" contains an excellent article on Henry Cavendish, a discussion of Polaroid, the new light polarizer, and a short description of a new process for making fibrous glass.

General Electric Co., Schenectady, N. Y. GEA-2505 describes Type AF-1 Circuit Breakers for office buildings and industrial plants.

General Electric Co. Schenectady, N. Y. GEA-2253A describes modern switchboard styling. A number of installations are shown.

High Speed Steel Alloys, Ltd., Widnes, Lancashire, England. "Alloy Metals Review" for January-February contains several instructive articles on alloys and their applications. The lead article is a discussion of "The Present Trend in Alloy Constructional Steels."

Leeds & Northrup Co., 4901 Stenton ave., Philadelphia, Pa. If, instead of reading about a piece of equipment, you prefer to examine it at first hand, you'll find that Leeds & Northrup has gone a long way toward meeting your wish by issuing a novel advertising piece to demonstrate their Silver-Anniversary Micromax Recorder. Cut to the actual shape of the recorder, its effect is almost to put a half-size model in your hands. You open the door of the case, then swing out the chart carriage and finally swing the whole mechanism into view, just as you would with a real Micromax.

The N. J. Zinc Co., 160 Front st., N. Y. City. The December issue of The Activator is devoted to a discussion of "Zinc Pigments in Rubber."

The International Nickel Co., 67 Wall st., N. Y. City. "Strength Plus-Monel for Mechanical Jobs" presents briefly, yet in an interesting and striking manner, the story of this nickel-copper alloy whose combination of mechanical properties with resistance to chemical corrosion has furnished the answer to many problems of industry.

Metallizing Co. of America, 1351 E. 17th st., Los Angeles, Calif., has just prepared a 36-page booklet which is a complete photographic story of the metal spraying process. This booklet covers thousands of applications in which Metallizing has proven its worth and will be received with interest by those concerned with lowering maintenance costs.

International Nickel Co., 67 Wall st., N. Y. City. "Nickelsworth" appears quarterly and gives an interesting review of new and novel uses for Monel, nickel, and Inconel.

The Northern Blower Co., West 65th st., Cleveland. Bulletin No. 163-1 illustrates and describes the "Norblo" Bag Type Dust Arrester. The entire unit is very simple in construction and all the parts are easily accessible.

Pangborn Corp., Hagerstown, Md. Bulletin No. 904 describes the Pangborn Electrostatic Precipitator for industrial air cleaning.

The Paper Service Co., Lockland, Ohio. The second of a series of "Data Sheets" on bulk packages and bulk packaging materials discusses a type of paperlined bag which is a complete container in one unit, which eliminates the purchasing of liners and bags separately and the insertion operation.

The Patterson Foundry & Machine Co., East Liverpool, Ohio. The story of the lowly soy bean to sparkling automobile finishes and the part Patterson electrically heated process kettles play in the operation.

Pfaltz & Bauer, Inc., Empire State Bldg., N. Y. City. A very detailed discussion of the Dr. Bruno Lange Photo-Electric Cells and Apparatus is now available in booklet form.

Precision Scientific Co., 1750 N. Springfield ave., Chicago. Bulletin TS 3000, 34 pages and cover, tells how to conduct accurate B.t.u. tests with a Flow-Type Gas Calorimeter. Crammed full of information from cover to cover, this new manual contains detailed instructions, approved by the U. S. Bureau of Standards, on how to set up the apparatus and conduct an accurate test; also includes essential calorimeter tables reproduced from Bureau of Standards Circular No. 65, now out of print. Covers the subject of flow calorimetry in a complete, practical and concise manner. Shows assembled and cross-sectional diagrams of the calorimeter, outlines of test procedure; lists necessary precautions and significance of errors, includes a brief bibliography and information on calorimeter parts and accessories.

Precision Scientific Co., 1750 N. Springfield ave., Chicago. Bulletin TS 3110, 8 pages, contains useful information and operating instructions pertaining to Wet Test Laboratory Gas Meters. Tells how to set up and operate the meter for most accurate results; includes correction factors for gas volume, table showing gas rate per hour, information on meter parts and accessories. A useful compilation of data for every laboratory using a wet test gas meter.

Pulmosan Safety Equipment Co., 176 Johnson st., Brooklyn, N. Y. One booklet describes Pulmosan-Schwenk Safety Tilters for drums, barrels and carboys, and another Pulmosan Safety Goggles.

Raymond Bros. Impact Pulverizer Co., 1302 N. Branch st., Chicago. Bulletin No. 28 discusses roller mill efficiency with whizzer type separator.

Milton Roy, 2031 E. Madison st., Philadelphia, Pa. A 4-page leaflet describes chemical pumps and proportioners, etc., designed for use in connection with water conditioning.

C. J. Tagliabue Manufacturing Co., Park & Nostrand aves., Brooklyn. Bulletin 699D should be in the hands of every oil chemist for it is truly an addition to their technical library as it contains listings and descriptions, as well as technical information, on every oil testing, instrument of importance, including thermometers, hydrometers, colorimeters, viscosimeters, flash and fire test apparatus, distillation apparatus, etc.

The C. J. Tagliabue Mfg. Co., Park & Nostrand aves., Brooklyn, N. Y., also announces the publication of a new TAG Laboratory Thermometer and Hydrometer catalog, No. 1100A.

United States Rubber Products, Inc., 1790 Broadway, N. Y. City. Designed to provide a wealth of easily accessible information on rubber hose for industrial use, U. S. Rubber Products, Inc., has just issued its new "U. S. Hose Catalogue" for 1937.

United States Rubber Products, Inc., 1790 Broadway, N. Y. City. In order to insure the most efficient application of industrial packings to the specific purposes for which they were designed has issued a 112 page manual on the subject. The manual, which is one of the most complete ever compiled for use by chemical, mining and petroleum engineers, plant operators and executives in these industries, has required the efforts of many engineers and technicians in its preparation.

Worthington Pump & Machinery Corp., Carbondale Division, Harrison, N. J. A new line of unit air conditioners with a wide range of air and refrigeration capacities is announced.

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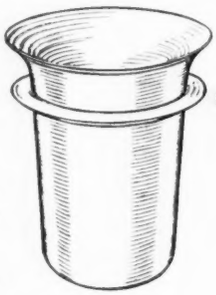

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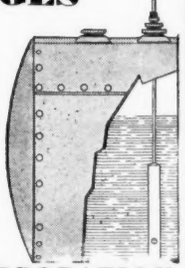

PETROMETER CORPORATION
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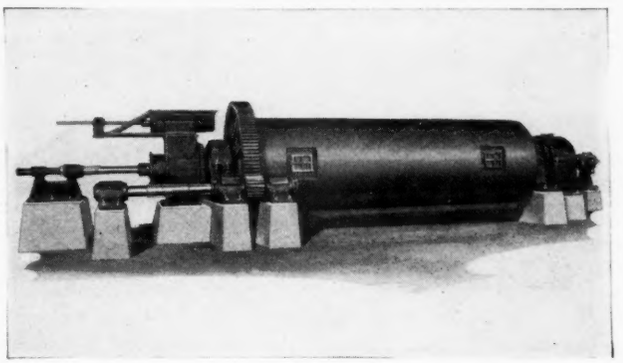
New Equipment

Continuous Feed and Discharge Tube Mill

Patterson Foundry & Machine, East Liverpool, Ohio, has developed a line of jacketed continuous feed and discharge tube mills for grinding and processing work of all kinds. By the use of this Mill the products can be heated during the grinding operation by circulating steam or hot oil through the jacket of the mill, or can be cooled by the circulation of cold water or



brine. Thus, materials which must be heated in order to induce liquefaction or to form vapor from the moisture content of the product, may be handled, while other products with low softening point may now be ground successfully by reducing the temperature within the mill below the softening point of the product.

New Sieve Shakers

For testing fine materials, the Newark Wire Cloth Co., Newark, N. J., has recently introduced a new "End-Shak" testing sieve shaker. It is provided with a simplified hold-down device, which permits the sieves to be easily and quickly put in place and removed. An outstanding feature is said to be the achievement of a combined reciprocating and turning motion.

Portable Strain Detector

Gaertner Scientific Corp., Chicago, has recently developed a portable strain detector which folds to fit into a compact leather carrying case measuring 16½ x 9½ x 2 inches. It may be set up in a few minutes and the cord plugged into 110 volt socket, after which the instrument is ready for use.

Rubber Suspensions for Equipment

Taming of machinery that frazzles the nerves of employees and threatens to crack the buildings in which it is located, is the latest victory of engineers, whose perfection of rubber suspensions for heavy factory units is opening an era of freedom from vibration and noise.

According to J. D. Tew, president of B. F. Goodrich Co., Akron, whose engineers developed vibro-insulators as a means of easing nervous strain and fatigue of employees working in buildings containing heavy machines in the Goodrich plant, rubber mountings are now being adapted to solve similar problems in nearly every industrial establishment.

Dust Collecting Unit with High Efficiency

A new electrostatic precipitator for general industrial air cleaning use with an operating efficiency as high as 99% by weight is announced by the Pangborn Corporation of Hagerstown, Md. Unit is particularly suitable for salvaging valuable dust, mass air cleaning, or removing objectionable particles from gas or vapor and similar applications.

Detecting Flammable or Toxic Gas Conditions

Two new gas indicators, have been announced by Linde Air Products Co., 30 E. 42nd st., N. Y. City. These instruments have been designed to supply industry's need for inexpensive, sturdy and portable apparatus, which will efficiently detect and indicate flammable gas concentrations or toxic air conditions in given atmosphere locations.

Portable pH Meter

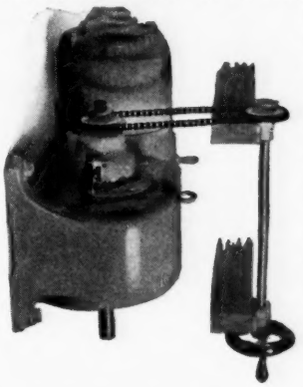
A new portable pH meter has recently been introduced by Thwing-Albert Instrument Co., Philadelphia. There are two models.

Clamps for Pipe Leaks

For service in every industry that uses pipe lines, the M. B. Skinner Co., of South Bend, Ind., has designed new clamps to stop leaks, whether the flow through the pipes be of chemicals or oil; or brine or vapor; ammonia or steam and it matters not at all whether the pipe lines be of high or low pressure.

Remote Control of Variable Speed

A new line of standardized parts for obtaining remote mechanical control of variable speed has been developed by



U. S. Electric Motors, Inc., Los Angeles, Calif., for use with the U. S. Varidrive Motor. The bearing supports, shafting, sprockets and chains have been standardized so that the user can obtain variation of speed on the driven machine conveniently and economically. The speed control is positive as there is no slippage in the control mechanism. Infinite speed variation within the speed range of the "Varidrive" may be obtained.

New Laboratory Heater

Supplementing its present line of laboratory heaters and hot plates, the Precision Scientific Co., 1736-54 N. Springfield ave., Chicago, announces its new Ful-Kontrol Laboratory Heater, which adjusts from 0 to 750 watts, for mild or intense heating.

Throughout the full range of heat control, variation is virtually stepless, actually running up the scale in increments of less than one volt.

Secret is a built-in auto-transformer instead of a conventional rheostat. Not only does the heat control cover a wide range, but heat dissipation is reduced, as a characteristic of the auto-transformer.

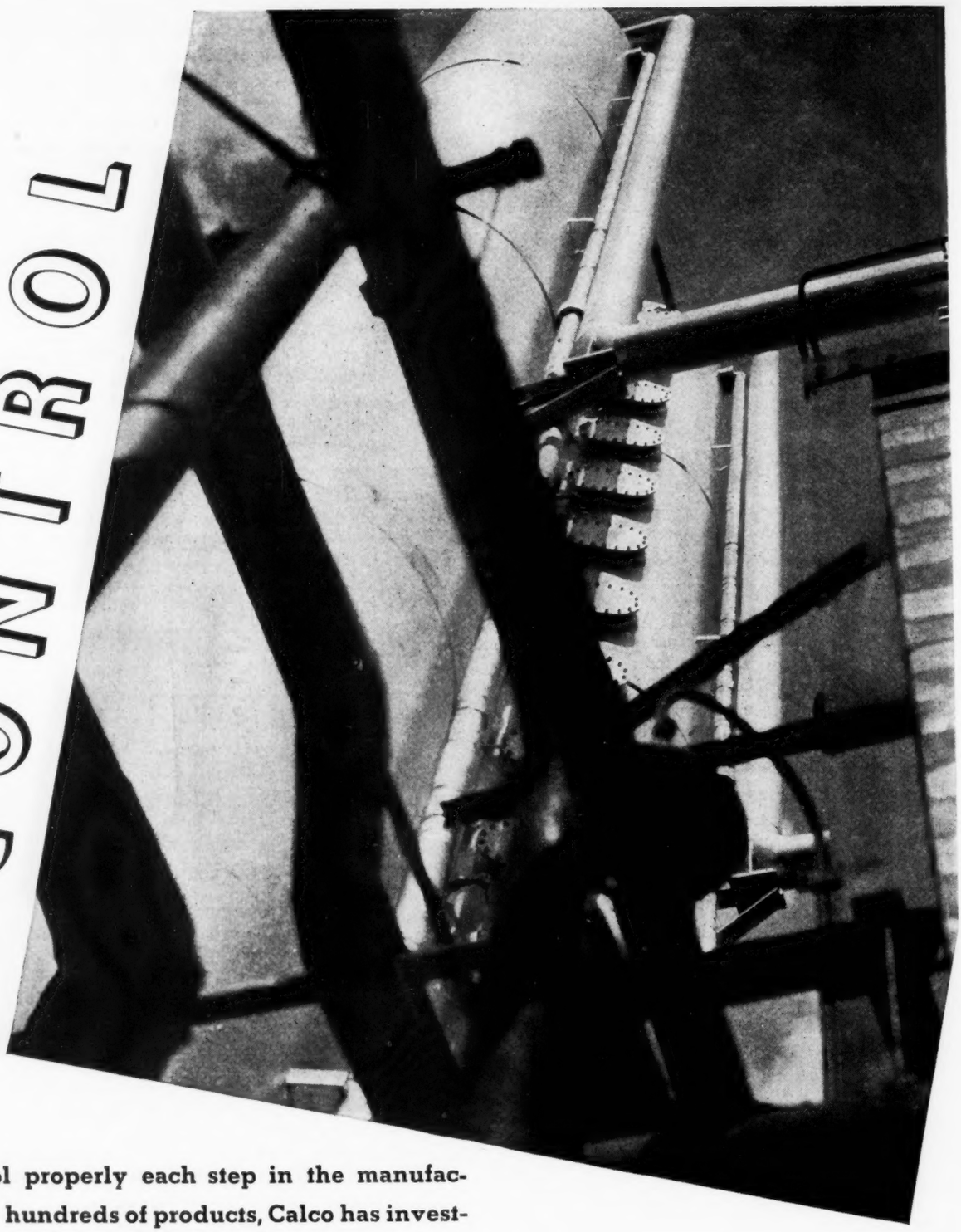
Motor Driven Tablet Machine

For manufacturers who have problems in compacting debulking, tabletting or compressing such products as catalysts, insulators, ceramics, chemicals, dyestuffs, pharmaceuticals, etc., the F. J. Stokes Machine Co., Philadelphia, Pa., offers a small motor driven tablet machine, which is economical and practical to operate and gives a reliable index of results which are possible on a production basis.

Harshaw Not Acquiring New Company

William A. Harshaw, president, Harshaw Chemical, has denied that his company was acquiring any other company although admitting that such reports had reached him. He stated, when asked if his company might be considering some expansion, "We are always receptive to opportunities but I know of nothing very imminent at the moment."

CONTROL



To control properly each step in the manufacture of its hundreds of products, Calco has invested many millions of dollars in plants for the refining of its raw materials. This control extends even to such basic commodities as naphthalene, benzol, toluol, xylol, and mineral acids.

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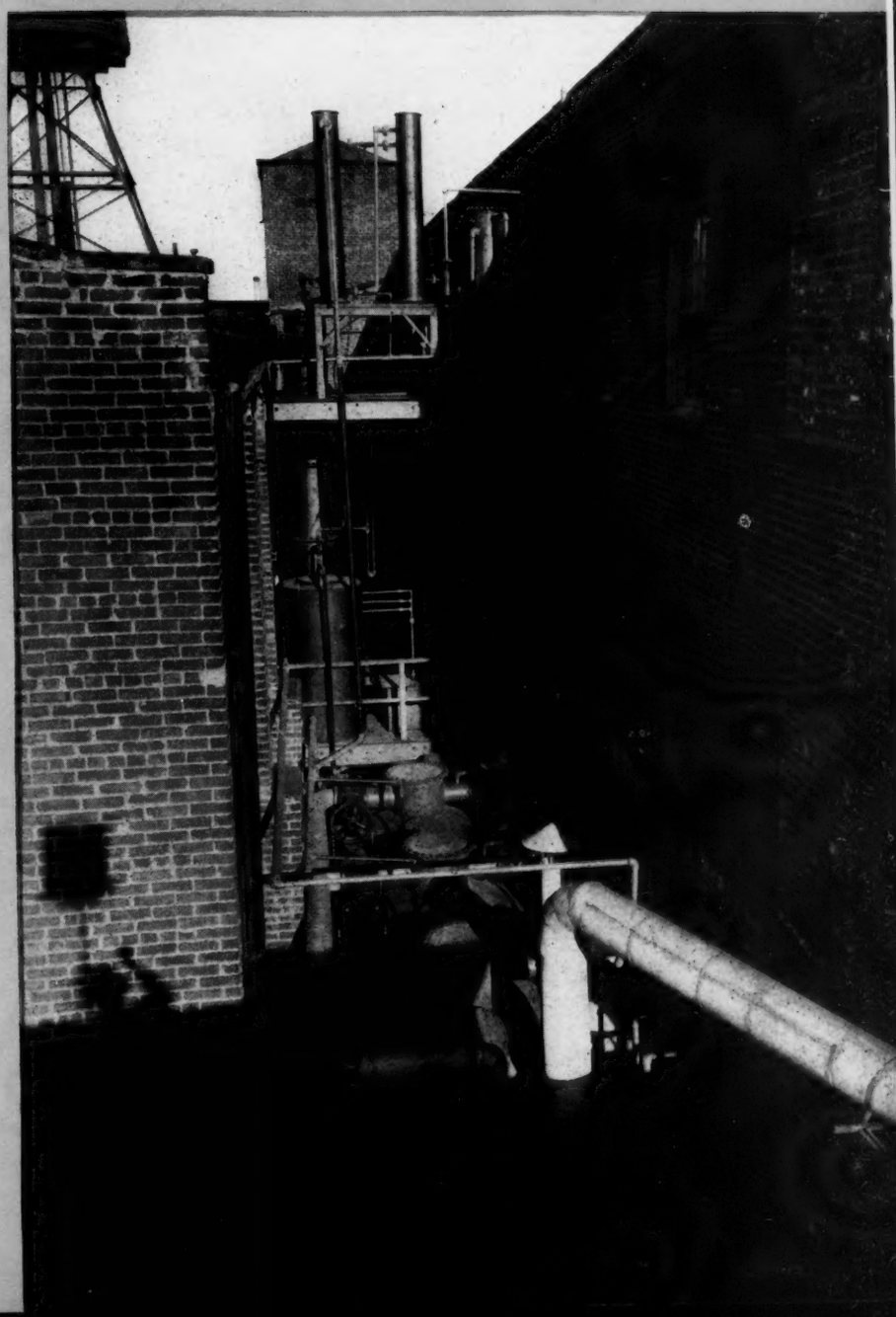
New Products and Processes

A Digest of Chemical Uses and U.S. Patents



An Acticarbone Process solvent recovery installation recently made by Acticarbone Corp. for the recovery of acetone, ethyl acetate and naphtha used in coating fabrics. Average capacity 2000 lbs. per day—area required 10' x 30'—efficiency over 95%.

AMYL NAPHTHALENES . . .

MONOAMYL NAPHTHALENE and Diamyl Naphthalene are now available from full scale commercial production. Each contains the amyl group in its isomeric forms. Both are somewhat viscous oily liquids, readily miscible with most organic solvents. The regular technical grades are deep amber in color, but, when properly purified, both the monoamyl and diamyl derivatives are practically water-white and odorless.

In spite of their high boiling points, Monoamyl and Diamyl Naphthalene can be distilled under atmospheric pressure without appreciable decomposition. They are not esters but hydrocarbons and under ordinary conditions they are not affected by water or dilute acids or alkalis.

Diamyl Naphthalene, having the lower vapor pressure, is of greater interest as a plasticizer than Monoamyl Naphthalene. It is stable, neutral, unsaponifiable, non-toxic and its solvent strength or compatibility makes it a desirable plasticizer for rubber resins as well as a number of other synthetic resins and asphaltic materials. Rubber will remain soft indefinitely when compounded with Diamyl Naphthalene.

Monoamyl Naphthalene has vapor pressure characteristics which make it of interest in the formulation of vehicles for certain types of inks and vitrifiable colors. It can also be used as a medium for constant temperature baths. Both Monoamyl and Diamyl Naphthalene remain liquid throughout a wide range of temperatures and they serve as coupling agents for some vegetable and mineral oils.

Monoamyl and Diamyl Naphthalene, as well as mixtures of the two, have desirable dielectric characteristics. Such mixtures sulfonate readily to produce interesting wetting agents and they can also serve as raw materials for the production of other derivatives.

PROPERTIES

	Monoamyl Naphthalene	Diamyl Naphthalene
Formula	$C_{10}H_7.C_5H_{11}$	$C_{10}H_6(C_5H_{11})_2$
Molecular Weight	198	268
Specific Gravity @ 20°C	0.96-0.97	0.93-0.94
Boiling Range (Atmospheric Pressure)	279-320°C	326-375°C
Boiling Point @ 20 mm.	158°C	198°C
50 mm.	189°C	231°C
75 mm.	205°C	248°C
100 mm.	213°C	258°C
125 mm.	219°C	264°C
150 mm.	225°C	270°C
175 mm.	230°C	275°C

	Monoamyl Naphthalene	Diamyl Naphthalene
Solidifies	−60°C	−30°C
Vapor Pressure @ 20°C	0.0098 mm.	0.0012 mm.
Flash Point (Open Cup)	277°F	326°F
Refractive Index @ 20°C	1.5727	1.5535
Viscosity @ 20°C—Poises	0.1195	0.9810
Specific Heat—Cal/gram	0.411	0.417
Heat of Vaporization Cal/gram (calc'd)	63.4	50.6
Action on Copper & Iron	None	None

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The Chemical Processing of Wool

By M. Harris and A. L. Smith

IN practical processing, wool is often exposed to conditions in which it may become partially oxidized. Under extreme conditions, such as may be encountered during severe bleaching or chlorination, the wool is oxidized to such an extent that the damage is readily detectable by visual examination or by ordinary physical testing methods. In well-controlled processes, however, the amount of oxidation is barely or not at all measurable by ordinary testing methods. The incipient damage which may be produced by mild oxidation is usually developed and accentuated during subsequent processing. It is apparent, therefore, that analytical methods for determining the extent of oxidation of wool are of importance for effective control during its processing.

In a series of studies at the National Bureau of Standards* relating to the oxidation of wool, and to the effect of alkalis on untreated and on oxidized wool, it was shown that the main point of attack by both oxidizing and alkaline reagents was the disulfide group of the cystine in wool. It was also shown that the oxidized wool is more susceptible to alkaline treatment than untreated wool, and that the extent to which the wool is oxidized bears a functional relationship to the decrease in the cystine content and to the increase in the alkali-solubility. Determination of the cystine content requires equipment, technique, and time which are not ordinarily available in the average textile-mill laboratory. On the other hand, the alkali method is comparatively rapid and simple, and, in most instances, appears to be more sensitive.

Alkali-solubility was determined by treating the wool with a 0.1 *N* solution of sodium hydroxide at 65° C. for one hour, the ratio of wool to solution being approximately 1:100, by weight. The wool was recovered on a Büchner funnel, washed with about 2 litres of water, dried to constant weight at 105° C., and the loss in weight determined. Samples of wool which had been severely oxidized became gelatinous during the alkali treatment. These samples were partially dried in an oven at about 50° C. for one hour and then dried at 105° C.

The use of the method as a control for commercial bleaching operations with hydrogen peroxide has been investigated, and the results obtained were in good agreement with those by other methods. The values obtained for the alkali-solubility of a given wool sample vary not only with the extent of oxidation, but also with the construction of the material being tested; that is, the amount of surface exposed. For example, a given sample of wool will lose more weight when it is in the form of yarn than when it is in the form of a closely woven fabric.

The use of chlorine and bromine for the production of unshrinkable wool textiles has recently received much attention. In addition, the chlorination process is frequently used to improve the lustre of wool. The great affinity of wool for these halogens and the ease with which the fibre is damaged by them are the chief reasons for their limited use. The evaluation and minimizing of the damage are two of the important problems connected with the successful use of the processes. Since the degradation of wool by halogens appears to be brought about by oxidation reactions, the alkali-solubility test was used to study the effects of the chlorination and bromination processes.

Samples of wool yarn, each weighing approximately 4 grammes, were treated for twenty minutes at room temperature with 160 c.c. portions of sodium hypochlorite and hypochlorous acid solutions, varying in concentration from 1 to 8 per cent. of chlorine based on the weight of wool. The effects of the treatments are recorded in Table I. With the exception of those samples treated with sodium hypochlorite solutions of concentrations higher than 4 per cent., the alkali-solubility increased, and the cystine content decreased with increasing concentrations of chlorine. The apparent discrepancies may be attributed to the fact that the more concentrated solutions of sodium hypochlorite probably dissolve a portion of the wool that would ordinarily be removed by the subsequent alkali treatment.

Table I. Effect on wool yarn of sodium hypochlorite and hypochlorous acid solutions of various concentrations at room temperature for 20 minutes

Treatment	Concentration* of Chlorine Per cent.	Change in Weight during Chlorination† Per cent.	Alkali-Solubility Per cent.	Cystine Content Per cent.
None	0	0.0	11.0	11.6
NaOCl	1	— 0.1	15.3	9.5
"	2	— 0.3	15.2	9.2
"	3	— 1.1	29.7	9.4
"	4	— 2.4	28.4	9.5
"	6	— 5.2	26.0	9.5
"	8	— 8.0	25.3	9.2
HOCl	1	+ 2.2	24.0	9.3
"	2	+ 2.6	30.1	9.0
"	3	+ 0.5	34.9	8.9
"	4	— 6.3	36.6	7.9
"	6	— 7.9	37.9	6.7
"	8	—13.1	43.5	6.8

* Based on the weight of wool.
† Plus sign indicates gain in weight; minus sign, loss in weight.

It has long been known that the chlorination process tends to reduce the wearing qualities of woolen fabrics. Various investigators have attempted to estimate wearing quality of chlorinated wool by relating it to tensile strength, extensibility, the presence or absence of scales, the solubility of the wool in acids and alkalis, and the altered affinity of the wool for dyestuffs. While chlorination undoubtedly influences these properties, a definite relationship between them and wearing qualities has not previously been demonstrated

From the standpoint of physical stability, the disulfide group constitutes what is probably the most important connecting link in the wool molecule. Since it has been shown that chlorine attacks the disulfide group and increases the solubility of wool in alkalis, it seemed desirable to relate results of the alkali-solubility test to those obtained from actual wear tests. Samples of carpet wools which had been treated with various concentrations of sodium hypochlorite solutions for the purpose of producing a desired lustre were analyzed for alkali-solubility and for cystine content. Wear tests on similarly treated carpets were made on a carpet wear-testing machine. The results not only demonstrate further applications of the alkali-solubility test, but also indicate a definite relationship between the physical and chemical degradation of the wool fibre.

The results of numerous investigations have shown that the breaking strength, milling properties, affinity for dyestuffs, and sulfur and nitrogen contents of wool are altered during the photochemical decomposition of the fibre. While the primary action of light on wool may not necessarily be an oxidation reaction, the chief point of attack is still the disulfide group of the cystine in the wool, and the alkali-solubility is correspondingly increased.

Samples of wool top were exposed to the radiation of a glass-enclosed carbon arc for different lengths of time from 5 to

* Work carried out at the U. S. Bureau of Standards on behalf of the American Association of Textile Chemists and Colorists. From Research Paper R. P. 928, published in the "Journal of Research" of the Bureau, Oct., 1936.

100 hours. It was found that there is a linear relationship between the increase in the alkali-solubility and the decrease in the cystine content of the exposed samples of wool.

The alkali-solubility test as outlined in this paper is comparatively rapid, and gives sufficiently reproducible results to recommend it as a method for determining the extent of oxidation of wool and as a control method in practical wool processes involving oxidative reactions. The use of the method as a control for a specific process requires the determination of limiting alkali-solubilities. These limits will depend on the type and construction of the material being processed and the use to which it will ultimately be subjected.

The Art of Mixing Dyes

In order to get a match to a given pattern, a dyer may use as many as six different colors—yet how often does he consider the effect of mixing any two of the dyes? Usually he trusts to luck and instinct, but it may be of interest to note that dyes do influence one another, first as regards solubility. S. R. Trotman and Bateman (*J. Soc. Dyers and Col.*, 1931) showed that whereas basic and acid dyes do usually precipitate one another from solution, this precipitation does not take place if the bath has a pH greater than 5.5. By taking advantage of this fact, a method of obtaining two-color effects on wool-viscose fabric in one bath was evolved.

The mutual precipitation of dyes has received considerable study in the past. Brown and Jordan (*J. Soc. Dyers and Col.*, 1923) note the fact that Naphthol Yellow and Night Blue throw each other from solution, and upon this reaction, a method of estimating each color has been worked out. Again, other dyes give similar reactions, for example, Chrysophenine G and Victoria Blue B, Methylene Blue and Benzopurpurine 4B, while Seyewetz records the mutual precipitation between Erythrosine and Magenta. Numerous other pairs are known, and it would appear that almost any basic and acid dyestuffs may be precipitated together if the optimum conditions were accurately known. The important factors appear to be pH and temperature.

The failure of this method to provide a means for the estimation of dyes in solution is due to the fact that, in general, pure standard specimens of assured integrity are usually unobtainable, and so the technique fails as an absolute method but still has some value as a means of comparison.

It has been shown by the I. G. that certain mixtures of vat dyes are faster than others, and they have worked out tables of suitable color mixtures to give the best fastness.

More recently it has been shown that cellulose acetate rayon may be dyed in good solid shades by the use of a mixture of colors when the application of any one singly is a failure and the fiber exhibits no appreciable affinity. Brit. Pat. No. 428,767 describes the use of two anthraquinone derivatives which yield deep blue shades on acetate rayon, while the same compounds employed separately would produce poor colorations. Six parts of 1-amino-4-anilido-anthraquinone and 4 parts of 1-amino-4-para-toluido-anthraquinone are dissolved in 100 parts of 98 per cent. sulfuric acid below 10° C., with stirring. The product is poured into ice water which precipitates the dyes which are then filtered off and well rinsed with water to remove acid, and finally dried. The product is applied to acetate rayon goods after being treated with a dispersing agent in a soap bath.

The essential idea of mixing two indifferent colors to obtain useful shades on acetate rayon is again seen in Brit. Pat. No. 428,841, which deals particularly with azo compounds. By coupling diazotized 4-nitro-2-chlor-aniline with dimethylaniline or di-ethyl-aniline, red dyes which give pale pink shades on acetate rayon are obtained. Mixed together, however, in equimolecular proportions, they give a strong Bordeaux red coloration.

Much work is still to be done in this field apparently and further technical papers or patents will be awaited with interest. Abstracted from an article by A. H. Pettinger, *American Dyestuff Reporter*, January 11, '37, p3.

Miscellaneous

Vistanex, a rubbery hydrocarbon, is available in two forms from Advance Solvents & Chemical Corp., 245-5th Ave., N.Y.C. Principal features are: usefulness in rubber compounding, for electric insulation; to improve adhesion and flexibility of waxes; for tank linings requiring no vulcanizing.

Sodium Sulfate to Lay Dust

Sodium sulfate may be a possible competitor of calcium chloride as a road dust layer and experiments to this end are being conducted by North Dakota School of Mines, Grand Forks, N. D.

Rubber Seed as a By-Product

Experiments with rubber seed as a profitable by-product of the rubber tree are being carried on in Netherlands East Indies. The light yellow oil contained in the seeds is suggested as a possible good substitute for linseed oil of the cheaper quality. *Rubber Age*, Feb., '37, p291.

Under-Fender Coating of Rubber

A special under-fender coating, made from a compounded rubber base, is a development of the Inland Mfg. Co., Dayton, O. It is said to deaden noise effectively.

Crease-Resistant Textiles

A new crease-resistant process developed by Manchester Dyers, Ltd., of England, involves the use of latex, resulting in a cotton material having a springy, crease-resisting character which is practically permanent. *Rubber Age*, Feb., '37, p288.

Odorless, Water-White Plasticizer

Nevillite Oil is an improved water-white plasticizing and solvent oil, which for all purposes is non-volatile. Product has high solvent strength, and is a plasticizer for chlorinated rubber coatings, pyroxylin lacquers, plastic compounds, fly paper, adhesives, printing inks, dyes, caulking compounds, waterproofing compositions, rubber resin finishes, aluminum pastes, and wherever an unsaponifiable, neutral, substantially non-drying oil is required. Manufactured by the Neville Co., Pittsburg, Pa.

Anti-Skinning Agent

Bartyl "A," non-malodorous anti-skinning agent for paints, is a development of Givaudan-Delawanna, Inc., 80-5th Ave., N. Y. City. Its advantages are several: 1. Mild, non-residual odor; 2. No effect on drying; 3. No effect on color; 4. Non-toxic; 5. Soluble in paints and solvents; 6. Economical to use; 7. Progressively effective; 8. Does not form slimy skin.

Platinum Recovery Process

A new process is now believed to have been perfected which may be of utmost importance to the South African platinum industry. The well-known mining chemist, John Eklund, has just successfully completed large-scale experiments for recovering platinum from the most difficult Northern Transvaal ores, which have hitherto defied every ordinary method of extraction on a commercial scale. Extractions upwards of 88 per cent. at a cost of 5s. per ton are claimed, and it will be possible to sell platinum at £4 an ounce. Steps are being taken to test the Eklund process on a full commercial scale. *Chemical Trade Journal*, Feb. 12, '37, iv.

Optical Lenses from Plastics

Production of optical lenses from plastics was recently demonstrated at the Waldorf Hotel, London, England. With specially designed molding machines it is possible to produce lenses already polished and ready for mounting into cameras, binoculars, spectacles, and all scientific instruments with an optical system. They are unbreakable, half the weight of glass, and have certain optical properties said to be superior to glass. One of the plastics used is known as "Perspex," a material recently developed by I. C. I., Ltd., London, England.

Rubber-Like Plastic

Flamenol, a polyvinyl chloride, is a flexible synthetic plastic manufactured by General Electric. Product is rubber-like in many respects yet differs from rubber in so many of its properties as to make it outstanding as an electrical insulating and cable-jacketing medium. Material can be extruded by the conventional rubber tubing machine and requires no curing.

Polymers of Hydrocyanic Acid

Conversion products of hydrocyanic acid (probably polymers thereof) useful as activators in chemical reactions and in particular in the metal treating industry are prepared by treating hydrocyanic acid with water in the presence of a catalyst, the concentration of the acid being below 57 per cent. Caustic soda, soda ash, and in particular an aqueous solution of ammonia are the preferred catalysts. The preferred amount of catalyst is 6 per cent. of the hydrocyanic acid used. A high concentration and a high reaction temperature produced a hard black material with an igneous appearance, and lower concentrations produce a dull black amorphous mass. This latter form is the more desirable product. In examples: (1) Ammonium hydroxide, liquid hydrocyanic acid and water is warmed to start the reaction, which then proceeds for four hours. The dull black product is removed by filtration; (2) commercial hydrocyanic acid, sodium carbonate and water are reacted at 135° F. for 255 minutes to give an 87 per cent. yield of dull black product. E. P. 456,151, to I. C. I., Ltd., London, England.

Sodium Zincate as Insecticide

Sodium zincate, to which is added an impregnant such as an aromatic hydrocarbon or a derivative of such a hydrocarbon, is suggested as an insecticide in E. P. 458,024. *Chemical Trade Journal*, Jan. 29, '37, p92.

Soya Bean Husks in Rayon

Soya bean husks as a raw material for making rayon are being experimented with by the Japanese. *Rayon Textile Monthly*, Feb. '37, p35 (79).

Formaldehyde for Use in Refrigerating Machines

Addition of small quantities of formaldehyde to liquid sulfur dioxide for use in refrigerating machines is noted in U. S. P. 2,019,559. Formaldehyde is helpful in avoiding corrosion troubles which may follow the accidental entries of small quantities of water into the refrigerant.

Research On Discoloration of Canned Cream

Results of researches so far carried out on the discoloration and corrosion in canned cream by C. J. Jackson, C. R. Howat, and T. P. Hoar have been issued as *Technical Publication Series A, Number 49*, of the International Tin Research and Development Council. Bronzing, purpling, and blackening of tin cans containing cream are shown to be due to tin sulfides produced by the breakdown of proteins when the temperature or the duration of the sterilizing process are too great. The liberation of sulfide from canned cream does not appear to be assisted by the presence of alkali; and although sodium bicarbonate is commonly used as a stabilizer in small amounts, this substance is probably beneficial in preventing purpling during storage.

Stable Colloidal Silver Solutions

A new method of obtaining stable solutions of colloidal silver, described by M. Morgnani in *La Chimica e L'Industria*, Jan. '37, is based upon passage of an alternating current between pure silver electrodes immersed in a solution of sodium gallate. Success depends largely upon the maintenance of an optimum hydrogen ion concentration, a *p*H of 6.8, using a 1 pro mille solution of sodium gallate, being found the most satisfactory. Colloidal silver prepared by the process described has a pink color and the solutions acquire a metallic blue reflex when concentrated. When observed under the ultra-microscope the particles are seen to be endowed with a strong brownian movement. The stability does not suffer after heating up to a temperature of 90° C.

Tobacco Oil from Discarded Seeds

A tobacco oil with high industrial value is being extracted by the Hungarian Tobacco Monopoly from the seeds which were formerly discarded. Favorable contracts have been arranged with leading oil mills for treatment of 30 to 40 wagon loads of the seed each year. *Chemical Age*, Feb. 13, '37, p151.

Magnesium Production from Dolomite

The possibility that deposits of dolomite available in Britain can be substituted for the imported magnesite used for the manufacture of magnesium is being investigated in England. The authority cited adds that the first batch of raw aluminum was produced at Clifton Junction (near Manchester) during December, and that, although the process employed is that of fusion electrolysis, the fundamental formulæ are preserved as a trade secret. *Chemical Trade Journal*, Feb. 12, '37, p142.

Insulating Brick

JM-20, new type of 2000° insulating brick, has been patented by Johns-Manville, N. Y. City. It was developed for use behind refractory walls in various types of high temperature industrial equipment and practically all types of furnaces, and can also be used for direct exposure at temperatures up to 2000° F. wherever there is no flame impingement, slag action, or mechanical abrasion.

New Photographic Developer

Use of the monomethyl ether of methyl pyrogallol as a photographic developer is described in *Angewandte Chemie*, Jan. 16, '37, in a paper read by Dr. H. Schultes before the Verein Deutscher Chemiker.

Liquid Delusterer

Liquid Delusterer, No. 95, product of O. F. Zurn Co., Phila., Pa., marks a new departure in the process of delustering. This preparation has no undesirable after-effects. Its effects are permanent. There is no later detrimental reaction, such as powdering. Product has been tried out thoroughly in a number of mills and has proved entirely successful in permanently delustering silk and rayon hosiery, underwear and piece goods.

Month's New Dyes

Two new dyestuffs are announced by du Pont's Dyestuffs Division. Du Pont Chromate Brown EBR, a chrome color yielding reddish chocolate-brown shades will be found useful for the production of the prevailing reddish shades of tan for men's wear woolens and worsteds. It can be dyed by the top chrome, chromate or bottom chrome methods. "Acetamine" Yellow 3G is a new acetate color which produces bright, greenish shades of yellow. It possesses excellent affinity for acetate fibers, builds up well in the bath and shows very good resistance to dry cleaning and satisfactory fastness to light, perspiration and washing.

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U. S. Chemical Patents

A Complete Check—List of Products, Chemicals, Process Industries

Agricultural Chemicals

Production phosphorus and phosphate fertilizer. No. 2,069,225. Harry A. Curtis, Knoxville, Tenn., to T. V. A., Wilson Dam, Ala.

Manufacture phosphate fertilizer and nitric acid. No. 2,069,226. Harry A. Curtis, Knoxville, Tenn., to T. V. A., Wilson Dam, Ala.

Preparation fertilizer containing monocalcium phosphate and a guanidine salt. No. 2,070,581. Harry A. Curtis, Knoxville, Tenn., to T. V. A., Wilson Dam, Ala.

Manufacture superphosphate. No. 2,070,582. Harry A. Curtis, Knoxville, Tenn., to T. V. A., Wilson Dam, Ala.

Thermal moisture method of manufacturing fertilizer ingredients. No. 2,070,658. Herman L. Hartenstein, Chicago, Ill.

Production fertilizers; calcining raw phosphate with lime and silicic acid. No. 2,070,697. Gerhard Tromel to Kaiser-Wilhelm-Institute fur Eisenforschung (eingetragener Verein), both of Dusseldorf, Germany.

Cellulose and Derivatives

Manufacture artificial lumber and the like from waste raw cellulosic material, using a synthetic resin in process. No. 2,068,926. James V. Nevin, Aberdeen, Wash.

Manufacture felted proofed fibrous materials; hydrating cellulose during operation. No. 2,069,771. Truman A. Pascoe and Roy P. Hella, Cloquet Minn., to Cellovis, Inc., Wilmington, Del.

Preparation delustered cellulosic product. No. 2,069,773. Ebenezer Emmet Reid, Baltimore, Md., to du Pont, Wilmington, Del.

Preparation delustered cellulosic structure. No. 2,069,774. Ebenezer Emmet Reid, Baltimore, Md., to du Pont, Wilmington, Del.

Production cellulosic structures having a low luster and/or opacity. No. 2,069,800. Winfield Walter Heckert, Ardentown, and Miles Augustinus Dahlen, Wilmington, Del., to du Pont, Wilmington, Del.

Preparation cellulosic structures, comprising a transparent cellulose derivative having opacity and/or low luster. No. 2,069,801. Winfield Walter Heckert, Ardentown, Del., to du Pont, Wilmington, Del.

Artificial cellulosic structure having a low or subdued luster. No. 2,069,802. Winfield Walter Heckert, Ardentown, and Wesley Rasmus Peterson, Carrcroft, Del., to du Pont, Wilmington, Del.

Regenerated cellulose structure containing an aromatic heterocyclic compound. No. 2,069,803. Winfield Walter Heckert, Ardentown, Del., to du Pont, Wilmington, Del.

Preparation delustered cellulosic articles. Nos. 2,069,804-5-6-7. Winfield Walter Heckert, Ardentown, Del., to du Pont, Wilmington, Del.

Method of analyzing mixed organic acid esters of cellulose. No. 2,069,892. Carl J. Malm and Gale F. Nadeau, Rochester, N. Y., to Eastman Kodak Co., Jersey City, N. J.

Treatment lignocellulosic materials; using dilute solution of caustic alkali and an acid solution of sulfur dioxide. No. 2,069,943. Henry Dreyfus, London, England.

Preparation cellulose organic ester compositions containing ethers of dioxanediol. No. 2,069,962. Jas. G. McNally and John J. Schmitt, Rochester, N. Y., to Eastman Kodak Co., Jersey City, N. J.

Manufacture alkali-soluble dicarboxylic acid esters of cellulose. No. 2,069,974. Ferdinand Schulze, Buffalo, N. Y., to du Pont, Wilmington, Del.

Process of embossing or decorating cellulosic plastics. No. 2,070,023. Oscar W. Olsen, Irvington, N. J., to Celluloid Corp., corporation of N. J.

Recovery of cellulose organic ester plastic materials. No. 2,070,027. Marvin J. Reid, Rochester, N. Y., to Eastman Kodak Co., Jersey City, N. J.

Chemical treatment of cut, green vegetable fibers for removal of foreign matter. No. 2,070,273. Theo. P. Haughey, Onancook, Va., to Harold H. Brown, New York City.

Manufacture cellulose from ligno-cellulosic products. No. 2,070,585. Henry Dreyfus, London, England.

Selective hydrolysis of mixed organic acid esters of cellulose. No. 2,070,602. Wm. O. Kenyon and Russel H. Van Dyke, Rochester, N. Y., to Eastman Kodak Co., Jersey City, N. J.

Manufacture artificial filaments, etc., containing organic derivatives of cellulose. No. 2,070,630. Percy Frederick Combe Sowter, Spondon, near Derby, England, to Celanese Corp. of America, a corporation of Del.

Electric conductor with insulated covering; organic derivative of cellulose used in process. No. 2,070,714. Camille Dreyfus, New York City.

Treatment artificial fibrous materials. No. 2,070,716. Henry Dreyfus, London, England.

Preparation cellulose solutions; treating a cellulosic body with an aqueous solution of a quaternary ammonium hydroxide. No. 2,070,999. Donald H. Powers, Moorestown, N. J., and Louis H. Bock, Bristol, Pa., to Rohm & Haas Co., Philadelphia, Pa.

Production aralkyl ethers of cellulose. No. 2,071,287. Eugene J. Lorand to Hercules Powder Co., both of Wilmington, Del.

Coal Tar Chemicals

Preparation indol sulfonic acids; heating 1-naphthylhydrazine-7-sulfonic acid and methylethylketone in presence of acetic acid as solvent. No. 2,068,800. Ernst Herdieckerhoff, Opladen, and Eduard Tschunkur, Cologne-Mulheim, Germany, to General Aniline Works, Inc., New York City.

Manufacture sulfonic acids of anthrapyrimidines. No. 2,068,989. Karl Koeberle and Otto Schlichting, Ludwigshafen-am-Rhine, Germany, to General Aniline Works, Inc., New York City.

Preparation arylamino-hydroxybenzenes. No. 2,069,039. Leopold Laska and Oskar Haller, Offenbach-am-Main, Germany, to General Aniline Works, Inc., New York City.

Production substituted aminochrysenes. No. 2,069,159. Werner Schultheis, Frankfort-am-Main-Hochst, and Gerhard Langbein, Hofheim in Taunus, Germany, to General Aniline Works, Inc., New York City.

Method obtaining substantially white, highly colored, chlorinated substitution products of naphthalene. No. 2,069,183. Ernst R. Hanson, Bloomfield, and Sandford Brown, Montclair, N. J., to Halowax Corp., New York City.

Manufacture oil soluble phenols. No. 2,069,294. Chas. Patton Wilson, Jr., Houston, Texas.

Production hydroxy primary aliphatic amines; subjecting the nitriles of aliphatic a-hydroxy carboxylic acids to reduction. No. 2,069,302. Henry Dreyfus, London, England.

Production diazoamino compounds. No. 2,069,461. Pierre Petitcolas, Rouen, France, to Campagnie Nationale de Matieres Colorantes et Manufactures de Produits Chimiques du Nord Reunies, Establissements Kuhlmann, Paris, France.

Preparation tertiary alkyl-cyclohexyl phenols. No. 2,069,560. Henry S. Rothrock to du Pont, both of Wilmington, Del.

Production phenolic compounds; condensation product of 3,5-dimethyl-cyclohexanone and a mononuclear monohydric phenol having its para position to phenolic hydroxyl unoccupied. No. 2,069,573. Elmer K. Bolton to du Pont, both of Wilmington, Del.

Production 2-3-dihydroindoles. No. 2,069,662. Max Treppenhauer, Mannheim, Germany, to General Aniline Works, Inc., New York City.

Manufacture monoketones of the pyrene series. No. 2,069,683. Roland Scholl, Dresden, Kurt Meyer, Berlin-Zehlendorf, and Joachim Donat, Dresden, Germany.

Composition of matter comprising a fluxed bituminous product containing constituents of pitch of pyrogenous distillate tar. No. 2,069,929. John H. Swanberg, Minneapolis, Minn., to Koppers Co., corporation of Del.

Preparation compounds of the thiourea series. No. 2,070,127. Josef Hilger, Leverkusen-Wiesdorf, Anton Ossenbeck, Cologne-Mulheim, and Ernst Tietze, Cologne-am-Rhine, Germany, to General Aniline Works, Inc., New York City.

Manufacture 3:6-diamino-10-methyl-acridinium methane sulfonate. No. 2,070,163. Paul Louis Gailliot, St. Maur-Des-Fosses, France, to Societe Des Usines Chimiques Rhone-Poulenc, Paris, France.

Preparation substituted arylacidylamino compounds. No. 2,070,207. Johann Huismann and Hugo Schweitzer, Wiesdorf, near Cologne-am-Rhine, Germany, to I. G., Frankfort-am-Main, Germany.

Production colored salts of organic ammonia derivatives and acid derivatives of nitrated anilines. No. 2,070,275. Karl Holzach and Fritz Lange, Ludwigshafen-am-Rhine, Germany, to I. G., Franfort-am-Main, Germany.

Coking retort oven for low or medium temperature coking. No. 2,070,587. Wilhelm Fitz, Essen, Germany, to Koppers Co., corporation of Del.

Method purifying fuel gas of ammonia and hydrogen sulfide. No. 2,070,620. John D. Price, Montreal, Que., Canada, to Koppers Co., corporation of Del.

Preparation xanthic formates; an aliphatic ester of a xanthic formic acid, having at least one aliphatic hydrocarbon radical having at least 8 carbon atoms. No. 2,070,634. James H. Werntz to du Pont, both of Wilmington, Del.

Method treating tar and pitch produced in coal gasification processes to increase the free carbon content. No. 2,070,961. Charles S. Reeve, Leonia, N. J., to Barrett Co., New York City.

Apparatus for carbonization or heat treatment of solid materials. No. 2,071,071. Stewart Roy Illingworth, Fernwood, Radyr, Wales, to Illingworth Carbonization Co., Ltd., Manchester, England.

Apparatus for distillation, calcination, or heat treatment of coal, shale, peat, wood, etc. No. 2,071,082. Samuel Moore, Hoylake, England, to Stellite Ltd., Queen's Ferry, near Chester, England.

Coatings

Method of applying metallic coatings. No. 2,068,687. Tadeusz Liban, Krakow, Poland.

Manufacture plywood; by applying successive coats of an aqueous solution of a resinous partial condensation product to a core surface; drying core after each coating; humidifying final coating; finally uniting coated core with a veneer by application of heat and pressure. No. 2,068,759. Jas. V. Nevin, Aberdeen, Wash.

Manufacture coating composition comprising chlorinated rubber and tung oil sulfurized by heating with not more than 1% sulfur. No. 2,068,818. Frank B. Root, West Orange, N. J., to Ellis-Foster Co., Montclair, N. J.

Method applying fusible glazes, enamels, and similar coatings to earthenware, tile, metal, and other non-absorbent materials. No. 2,068,892. Howard V. Schweitzer, McKeesport, Pa., and Davis A. Cable, East Sparta, Ohio, to U. S. Quarry Tile Co., Parkersburg, W. Va.

Production metallic paint, consisting of a metallic powder, asphalt emulsion embodying solids, a solvent for bitumen, and water. No. 2,068,966. Robert R. Thurston, Scarsdale, N. Y., and Raymond J. Ruble, Beacon, N. Y., to Texas Co., New York City.

Coating and method of protecting metallic surfaces against corrosion. No. 2,068,995. Kenneth Edw. Hunter Rodwell, London, England, to Rangi, Ltd., Nairobi, Kenya, East Africa.

Method reducing tendency to curl of a film, foil, thin sheet, or like product; using a film-forming solution containing a derivative of cellulose. No. 2,069,202. Bjorn Andersen, Maplewood, and Ralph H. Ball, Elizabeth, N. J., to Celluloid Corp., corporation of N. J.

Method decorating wood surfaces; using transparent liquid compound including glue, glycerine, and barium sulfate in process. No. 2,069,228.

Patents digested include issues of the "Patent Gazette," January 26 through February 16 inclusive.

Karl Eichstadt, Charlottenburg, Germany, to Oxford Varnish Corp., Detroit, Mich.

Preparation lacquer enamel coating to prevent spangling and discoloration of the interior of metallic containers by the action of food products sealed therein. No. 2,069,247. Lehman E. Hoag, Bellwood, Ill., to American Can Co., New York City.

Production enamel and varnish, capable of drying in a hard irregular finish upon being baked. No. 2,069,252. Harvey G. Kittredge and Albert J. Turner to Kay & Ess Chemical Corp., all of Dayton, O.

Prevention of efflorescence on silicate films. No. 2,069,486. Paul S. Tilden, New York City.

Method removing scratches from Celluloid motion picture negative and positive films; using a solvent and lacquer during process. No. 2,069,501. Arthur J. Miller, Tenafly, N. J., to Cinema Patents Co., Inc., New York City.

Production protective priming coating for rusted surfaces; using a drying oil emulsion of the glyceride type emulsified in a water solution of a soluble chromate. No. 2,069,660. Arthur T. Saunders to Truscon Labs., both of Detroit, Mich.

Preparation drying oil composition, comprising heat-treated mixture of tung oil and resorcinol-acetone resin. No. 2,069,725. John B. Rust, Orange, N. J., to Ellis-Foster Co., Montclair, N. J.

Production lacquer comprising a cellulose derivative and a resinous material, the components of which are soluble in coal-tar hydrocarbons and insoluble in petroleum hydrocarbons. No. 2,069,726. Jacob M. Schantz to Hercules Powder Co., both of Wilmington, Del.

Production floor covering; using in process a plastic vulcanizable aqueous mixture of concentrated rubber latex. No. 2,069,753. John C. Emhardt, Orange, Conn., to Sidney Blumenthal & Co., Inc., New York City.

Preparation thin flexible film composition; comprising mixture of a film forming emulsion and a water-insoluble salt of a sulfonated vegetable oil. No. 2,069,787. Peter A. van der Meulen to John R. Ditmars, both of New Brunswick, N. J.

Coating machine for applying internal and external paraffin coats. No. 2,069,845. Jens A. Paasche, Wilmette, Ill.

Preparation coating composition comprising methyl methacrylate polymer and a resin. No. 2,069,983. Richard T. Ubben to du Pont, both of Wilmington, Del.

Process applying a continuous colored coating to surface of roofing granules of refractory mineral material; depositing thereon coloring material and heat softened cryolite. No. 2,070,359. Carl E. Hillers to Blue Ridge State Corp., both of Charlottesville, Va.

Preparation resinous coating; film comprising reaction products formed by esterification of turpinene-maleic anhydride by polyhydric alcohols. No. 2,070,553. Jos. C. Pullman to Bert C. Miller, Inc., both of New York City.

Process treating galvanized coatings; using zinc. No. 2,070,554. Julian L. Schueler and Chalmer L. Heninger to Continental Steel Corp., all of Kokomo, Ind.

Manufacture laminated films; method of forming a prolamine base film with a surface coat thereon. No. 2,070,596. Donald W. Hansen, Decatur, Ill., to Prolamine Products, Inc., Dover, Del.

Process and apparatus for reproducing colors by process engraving. No. 2,071,136. Fred. J. Meinzinger to Meinograph Process, Inc., both of Detroit, Mich.

Dyes, Stains, etc.

Production disazo dyestuffs insoluble in water, and fiber dyes therewith. No. 2,069,158. Karl Schnitzpahn, Offenbach-am-Main, and Paul Jörg, Frankfort-am-Main-Hochst, Germany, to General Aniline Works, Inc., New York City.

Preparation dyestuff paste for use in printing; comprising a dibenzanthrone dyestuff and a hydroxyalkyl ether. No. 2,069,209. Geo. M. Bishop, Buffalo, N. Y., to National Aniline & Chemical Co., Inc., New York City.

Preparation flavanthrone dyestuff and printing paste. No. 2,069,210. Geo. M. Bishop, Buffalo, N. Y., to National Aniline & Chemical Co., Inc., New York City.

Production dyestuffs of the gallocyanine series. No. 2,069,475. Eugen Huber, Leverkusen-I. G. Werk, Germany, to General Aniline Works, Inc., New York City.

Production vat dyestuffs of the anthraquinone series. No. 2,069,663. Arthur Wolfram, Frankfort-am-Main, Paul Nawiasky, Ludwigshafen-am-Rhine, Gerhard Langbein, Hofheim in Taunus, and Werner Elbs, Frankfort-am-Main, Germany, to General Aniline Works, Inc., New York City.

Preparation thiazine dyestuff. No. 2,069,670. Walther Hoffmann, Frankfort-am-Main, Germany, to General Aniline Works, Inc., New York City.

Production monoazo dyestuffs. No. 2,069,740. Richard Fleischhauer, Frankfort-am-Main, Fechenheim, and Carl Theo. Schultis, Bergen, near Hanau-am-Main, Germany, to General Aniline Works, Inc., New York City.

Production azo dyestuffs. No. 2,069,743. Hans Krzikalla and Paul Garbsch, Ludwigshafen-am-Rhine, Germany, to General Aniline Works, Inc., New York City.

Production monoazo dyestuffs. No. 2,069,836. Arthur Howard Knight, Blackley, Manchester, England, to Imperial Chemical Industries, Ltd., London, Engalnd.

Manufacture azo dyestuffs insoluble in water. No. 2,070,104. Werner Zerweck, Frankfort-am-Main-Fechenheim, and Norbert Steiger, Frankfort-am-Main, Germany, to General Aniline Works, Inc., New York City.

Preparation azo dyestuffs insoluble in water. No. 2,070,119. Ernst Fischer, Offenbach-am-Main, Germany, to General Aniline Works, Inc., New York City.

Production cupriferous azo dyestuffs. No. 2,070,292. Mordecai Mendoza, Blackley, Manchester, England, to Imperial Chemical Industries, Ltd., London, England.

Production printing paste; comprising a dispersed water-insoluble vat dye, a reducing agent, and a dispersion of a white, water-insoluble organic pigment. No. 2,070,467. Ivan F. Chambers to du Pont, both of Wilmington, Del.

Preparation vat dyestuff in powder form, suitable for printing. No. 2,070,739. Carl Krauss and Max Pommer, Frankfort-am-Main, Fechenheim, Germany, to General Aniline Works, Inc., New York City.

Production azo dyestuffs. No. 2,070,997. Emil Eduard Misslin, Basel, and Rudolf von Capeller, Riehen, Switzerland, to Society of Chemical Industry in Basle, Basel, Switzerland.

Production dyestuffs of the pyrone series. No. 2,071,130. Hans Krzikalla and Paul Garbsch, Ludwigshafen-am-Rhine, Germany, to General Aniline Works, Inc., New York City.

Explosives

Production ammonium nitrate blasting explosive charge, characterized by high blasting strength and relatively high density. No. 2,069,612. Wm. E. Kirst, Woodbury, N. J., and Clifford A. Woodbury, Media, Pa., to du Pont, Wilmington, Del.

Fine Chemicals

Production pyrazolones containing wholly or partially hydrogenated cyclic hydrocarbon radicals. No. 2,068,790. Max Bockmuhl and Walter Krohs, Frankfort-am-Main-Hochst, Germany, to Winthrop Chemical Co., Inc., New York City.

Manufacture quaternary heterocyclic acid amide compounds. No. 2,068,824. Fritz Schönhofer and Hans Henecka, Wuppertal-Elberfeld, Germany, to Winthrop Chemical Co., Inc., New York City.

Mechanically producing sound records on supports comprising in a mixture colloids capable of being tanned and such light sensitive organic compounds as exert a tanning action in the light on the said colloids, and fixing records by exposure to light. No. 2,068,919. Gustav Kogel, Baden-Baden, Germany.

Production salicylic esters of the lower aliphatic mono-carboxylic acid esters of glycols; these substances being suitable for percutaneous application. No. 2,069,175. Ernst Preiswerk, Munchenstein, near Basel, Switzerland, to Hoffmann-LaRoche, Inc., Nutley, N. J.

Production a cyclopentanone mono-substituted in the a-position by a radical selected from the group of alkyl and alkylidene radicals having from 4 to 10 carbon atoms. No. 2,069,861. Alex. St. Pfau, Geneva, Switzerland, to Givaudan-Delawanna, Inc., New York City.

Production series of dye images fixed on a metallic mordant in gelatin coated motion picture film. No. 2,070,222. Percy Douglas Brewster, Rumson, N. J.

Manufacture water-white hydrobromic acid solution. No. 2,070,263. Grayton F. Dressel and Otto C. Ross to Dow Chemical Co., all of Midland, Mich.

Glass and Ceramics

Manufacture laminated safety glass; comprising two sheets of glass and an interposed plastic layer formed by dispersing an organic cellulose derivative in an unpolymerized, unsaturated organic ester, then polymerizing ester after complete mixing. No. 2,068,782. Geo. B. Watkins and Jos. D. Ryan, to Libbey-Owens-Ford Glass Co., all of Toledo, O.

Manufacture glass building unit, at least 2 opposite layers of which are covered with a layer of completely polymerized synthetic resin. No. 2,068,798. David E. Gray, to Corning Glass Works, both of Corning, N. Y.

Manufacture borosilicate glass containing cerium, which also contains alkali oxide and an oxide of the barium and zinc groups. No. 2,068,801. Harrison P. Hood to Corning Glass Works, both of Corning, N. Y.

Continuous process for forming blanks for ceramic ware. No. 2,069,059. Albra H. Fessler to General Motors Corp., both of Flint, Mich.

Production ceramic materials substantially free of alkali, using boric acid in process. No. 2,069,060. Albra H. Fessler, Flint, Mich., to General Motors Corp., Detroit, Mich.

Manufacture laminated glass. No. 2,069,425. Chas. S. Shoemaker, Jeannette, Pa., to American Window Glass Co., Pittsburgh, Pa.

Production a vitreous enameled product; applying vitreous enamel on a precipitation-hardening alloy. No. 2,070,272. Oscar F. Harder and John D. Sullivan to Battelle Memorial Institute, all of Columbus, Ohio.

Industrial Chemicals, Equipment

Manufacture spalling-resistant refractory and chemically neutral, burned brick. No. 2,068,641. Geo. Milroy Carrie, Montreal, Que., and James Wm. Craig, Frank Eugene Lathe and Arthur Clarence Halferdahl, Ottawa, Ont., Canada.

Color mixing machine. No. 2,068,646. Paul L. Hexter to Arco Co., both of Cleveland, O.

Manufacture chlorine substituted butanes wherein 1,1-dichlorethane is treated with chlorine substituted ethylenes in presence of aluminum chloride. No. 2,068,772. Johann Sixt to Consortium Fuer Elektrochemische Industries, G. m. b. H., both of Munich, Germany.

Thermal treatment of carbonaceous substances. No. 2,068,868. Mathias Pier, Heidelberg, Wilhelm Rumpf, Ludwigshafen-am-Rhine, and Ernst Donath, Mannheim, Germany, to I. G., Frankfort-am-Main, Germany.

Purifying aliphatic alcohols by contact catalysts. No. 2,068,872. Raphael Rosen, Cranford, and Francis M. Archibald, Elizabeth, N. J., to Standard Oil Development Co., corporation of Delaware.

Preparation titanium compounds, suitable for dyeing, mordanting, tanning, lake manufacture, etc. No. 2,068,877. Howard Spence and Sydney Francis Wm. Crundall, to Peter Spence & Sons, Ltd., all of Manchester, England.

Apparatus and method for treating alkali-earth carbonate materials. No. 2,068,882. Robert S. Walker, Bellefonte, Pa., to Electro Lime & Ice Corp., Wilmington, Del.

Apparatus for producing laminated materials. No. 2,068,893. Kimberly Stuart, Neenah, Wis., to Garrett B. Linderman, Jr., Beverly, N. J.

Preparation ether acids by treating an anhydrous mono-hydric alcohol with an alkali metal monoxide and adding an anhydrous neutral ester of a halogenated carboxylic acid. No. 2,068,905. Herman A. Bruson, Germantown, Pa., to Resinous Products & Chemical Co., Phila., Pa.

Apparatus and process for continuously removing volatile matter from a liquid. No. 2,068,971. Arthur U. Ayres, Chestnut Hill, and Nathaniel Brewer, Lansdowne, Pa., to Sharples Specialty Co., Philadelphia, Pa.

Process uniting a fibrous layer containing animal fiber to a base. No. 2,068,975. Alden W. Coffman to H. H. Robertson Co., both of Pittsburgh, Pa.

Process dissipating ground or sea fog; precipitating fog by disseminating thereinto a dry finely divided water-absorptive gel-forming medium. No. 2,068,987. Wm. C. King, Jr., Pittsburgh, Pa.

Improved carbonaceous fuel having a reduced clinker tendency; using refractory clay and bauxite in process. No. 2,069,074. James Henry Lum and Rodger Lewis Schaefer, Dayton, O., to Stonega Coke and Coal Co., Inc., Phila., Pa.

Apparatus for producing cellular cementitious materials. No. 2,069,078. John A. Rice and Richard B. Rice to Bubblestone Co., all of Berkeley, Calif.

Concentration of phosphatic material in the form of a pulp, to separate phosphatic from other constituents. No. 2,069,182. Johnson Hagood, Avenel, N. J., to American Agricultural Chemical Co., Newark, N. J.

Manufacture vanillin from liquor containing lignin sulfonic acids; using hot caustic alkali and carbon dioxide in process. No. 2,069,185. Harold Hibbert, Montreal, Que., and Geo. H. Tomlinson, Jr., Westmount, Que., Canada, to Howard Smith Chemicals, Ltd., Montreal, Que., Canada.

Process converting soybean oil and of obtaining lecithin. No. 2,069,187. Henry R. Kraybill, Lafayette, Ind., to Purdue Research Foundation, West Lafayette, Ind.

Composition for purification of gas by removal of hydrogen sulfide; consisting of an absorption sponge containing hydrated iron oxide and calcium sulfate. No. 2,069,194. Joseph W. Ayers to C. K. Williams & Co., both of Easton, Pa.

Manufacture of ketene. No. 2,069,243. George D. Graves and Crawford H. Greenewalt to du Pont, all of Wilmington, Del.

AN adequate intake of calcium and phosphorus through the daily diet is today accepted by the medical profession as a necessity. The calcium phosphate ($Ca_3(PO_4)_2$) content of the human body at birth is 60 to 90 grams; at middle age about 3500 grams . . . a supply that must be constantly replenished if bone, tooth, and nerve structure is to be properly nourished.

Nature provides us abundantly with both calcium and phosphorus in a wide selection of foods. However, to make them more tasty, man often strips away heedlessly these vital minerals. To compensate for the deficiency thus created, tablets of pure calcium phosphate (an excellent source of calcium and phosphorus) are sold in increasing volume by most drug stores.

As the world's largest manufacturers of food grade phosphoric acid and its salts, it has been Victor's good fortune to play an important part in making these important minerals . . . calcium and phosphorus . . . so readily and economically available.

VICTOR CHEMICAL WORKS

141 W. Jackson Blvd., Chicago, Ill.

The facts stated above relative to the importance of calcium and phosphorus in the daily diet should be of particular interest to manufacturers of pharmaceuticals, salt, flour, sugar, sodium bicarbonate, breakfast foods, infants' foods, etc.

VICTOR Chemicals

Production stabilized fats and oils. No. 2,069,265. Sidney Musher to Musher Foundation, Inc., both of New York City.

Production bituminous compositions; distilling an asphaltite at 698-752° F. until 15-25% of its weight is lost. No. 2,069,314. James K. Hunt and Jos. Harrel Shipp to du Pont, all of Wilmington, Del.

Production derivatives of polyhydric alcohols. No. 2,069,336. Otto Schmidt, Ludwigshafen-am-Rhine, and Egon Meyer, Mannheim, Germany, to I. G., Frankfort-am-Main, Germany.

Preparation flotation reagent for oxide ore; comprising oleic acid, cresylic acid, soda ash, and sodium silicate. No. 2,069,365. Royal S. Handy, Kellogg, Idaho.

Method for separating substances from gaseous mediums. No. 2,069,389. David D. Peebles, Eureka, Calif.

Manufacture alkali metal alcoholates. No. 2,069,403-4. Geo. Lewis Cunningham, Niagara Falls, N. Y., to Mathieson Alkali Works, Inc., New York City.

Apparatus for distillation of solid carbonizable fuel. No. 2,069,421. Edoardo Michele Salerni, London, England, to Societe d'Etudes et de Valorisation Industrielle des Combustibles, Societe a Responsabilite Limitee, Paris, France.

Concentration dilute sulfuric acid containing amyloid. No. 2,069,472. John Roy Dufford to Patterson Parchment Paper Co., both of Bristol, Pa.

Production nitrogenous condensation products. No. 2,069,473. Friedrich Ebel, Mannheim, Germany, to General Aniline Works, New York City.

Process polymerizing hydrocyanic acid and product thereof. No. 2,069,543. Horace Chamberlin Adams, Glendora, and Howard Donovan Green, Pasadena, Calif., to du Pont, Wilmington, Del.

Synthesis of hydrocyanic acid. No. 2,069,545. Paul Johnson Carlisle and Alexander Douglas Macallum, Niagara Falls, N. Y., to du Pont, Wilmington, Del.

Separation of chloranisidine isomers. No. 2,069,546. Thos. S. Carswell, Kirkwood, Mo., to Monsanto Chemical Co., St. Louis, Mo.

Product and process of sulfation of compounds obtained by hydrogenation of carbon oxides. No. 2,069,547. Richard G. Clarkson to du Pont, both of Wilmington, Del.

Method treating hydrated titanium dioxide precipitated by hydrolysis of titanium salts. No. 2,069,554. Reginald Hill Monk and Archibald Stewart Ross, Montreal, Que., Canada, to American Zinc, Lead & Smelting Co., St. Louis, Mo.

Production isobutylene and tertiary butyl chloride. No. 2,069,624. Carl F. Prutton, Cleveland, Ohio, and Walter E. Roush, Midland, Mich., to Dow Chemical Co., Midland, Mich.

Preparation carbon tetrachloride containing a stabilizing amount of a ureide. No. 2,069,711. Edmund C. Missbach, Oakland, Calif., to Stauffer Chemical Co., corporation of Calif.

Apparatus and process for dividing viscous masses. No. 2,069,731. Gottfried Trumpler, Kusnacht (Zurich), Switzerland, to Lonza Elektrizitatswerke und Chemische Fabriken Aktiengesellschaft, Basel, Switzerland.

Manufacture partially soluble felted fibrous articles; using for felting operation a cellulosic paper-making stock including hydrated cellulose. No. 2,069,763. W. Bartlett Jones, Chicago, Ill., to Cellovis, Inc., Wilmington, Del.

Manufacture retene and other compounds. No. 2,069,896. Fred W. Muncie, Jacksonville, Fla., to Wood Chemical Products Co., Cleveland, O.

Production insulating material having a high dielectric constant. No. 2,069,903. Werner Soyck, Berlin-Pankow, and Alfred Ungewiss, Berlin-Halensee, Germany.

Manufacture nickel carbonyl from nickel mattes and similar materials of non-metallic character. No. 2,070,079. Chas. Frederick Reed Harrison, Selley Oak, Birmingham, and Albert Edward Wallis, Clydach, England, to International Nickel Co., New York City.

Removal hydrogen sulfide from hydrocarbon bases. No. 2,070,098. Lee S. Twomey, Vista, Calif.

Manufacture condensation products from aliphatic aldehydes. No. 2,070,131. Walter Philip Joshua, London, and Herbert Muggleton Stanley, Great Bookham, England, Otto Fuchs, Frankfort-am-Main, and Wilhelm Querfurth, Mainz-Mombach, Germany, and John Blair Dymock, Cheam, England.

Purification of natural deposits. No. 2,070,161. Roland W. Flinn, Oakland, Calif.

Process for dehydrating pulps. No. 2,070,201. Jas. F. Geary, Salt Lake City, Utah, one-fourth to De Witt Van Evera, Salt Lake City, Utah, and one-fourth to J. Wilbur Van Evera, Crosby City, Minn.

Manufacture white lead pigment. No. 2,070,213. Thos. A. Mitchell to Hughes-Mitchell Processes, Inc., both of Denver, Colo.

Apparatus and method of making sulfur dioxide. No. 2,070,236. Edwin J. Mullen, New Rochelle, N. Y., to General Chemical Co., New York City.

Manufacture sulfur bearing oil. No. 2,070,256. Bernard M. Carter, Montclair, N. J., Theo. V. Fowler, Pelham, N. Y., and Henry F. Merriam, West Orange, N. J., to General Chemical Co., New York City.

Production tertiary butyl alcohol. No. 2,070,258. Gerald H. Coleman and Garnett V. Moore, to Dow Chemical Co., all of Midland, Mich.

Preparation dielectric medium; using a mixture of diphenyl and complex hydrocarbons. No. 2,070,268. Hugh Bryson Glass, Anniston, Ala., to Swann Research, Inc., corporation of Ala.

Production high molecular weight aliphatic alcohol. No. 2,070,318. Reginald John Rosser and Herbert Swann, Manchester, England, to Imperial Chemical Industries, Ltd., London, England.

Production composition fuel, using silicate of soda in process. No. 2,070,428. Frederick H. Ford to Shaler Co., both of Waupun, Wis.

Process and apparatus for purifying liquids. No. 2,070,453. Clarence J. Rodman, Alliance, O.

Method converting carbon monoxide into formic acid. No. 2,070,503. Christian Ammon, Berlin-Wilmersdorf, Germany.

Manufacture mercaptobenzothiazole; reacting with sulfur the reaction product of formamid and aniline. No. 2,070,522. Albert M. Clifford, Stow, O., to Wingfoot Corp., Wilmington, Del.

Preparation ethylene benzothiazyl 1-thio hydrin; by reacting a soluble alkaline salt of a 1-mercaptobenzothiazole with an ethylene halogen hydrin. No. 2,070,523. Albert M. Clifford, Stow, O., to Wingfoot Corp., Wilmington, Del.

Production flexible wood-faced material; comprising a single thickness of thin flexible wood veneer, a backing layer of flexible thermoplastic tissue, interposed flexible reinforcing means, and adhesive securing the whole together. No. 2,070,527. Armin Elmendorf, Chicago, Ill., to Flexwood Co., corporation of Del.

Apparatus for emulsifying immiscible fluids. No. 2,070,545. Riley L. Gilbert, Chicago, Ill., to Riley L. Gilbert, L. L. Davis, Jr., and Arthur J. Ferguson, as trustees of a common law trust estate entitled The Gilbert Foundation, all of Chicago, Ill.

Preparation core composition for plaster board; using karaya gum and calcined gypsum in process. No. 2,070,551. Geo. D. King, to U. S. Gypsum Co., both of Chicago, Ill.

Digesting process and apparatus. Nos. 20,266-7. Reissues. Thomas Leonidas Dunbar and Albert Darius Merrill, Watertown, N. Y.

Fibrous sheet material. No. 20,271. Reissue. Stephen B. Neiley, Winchester, Mass., to Dewey & Almy Chemical Co., No. Cambridge, Mass.

Manufacture disintegration products of starch; using sodium hypochlorite in process. No. 2,070,576. Benno Bochskandl, Hamburg, Germany, to International Patents Development Co., Wilmington, Del.

Apparatus and method for removing particles from gases. No. 2,070,578. Reginald G. Bowman, Gary, Ind., to Traughber Engineering Co., corporation of Ohio.

Production alcohols. No. 2,070,597. Clyde O. Henke, Wilmington, Del., and Roland G. Benner, Carney's Point, N. J., to du Pont, Wilmington, Del.

Preparation butadienes and chlorinated derivatives thereof. No. 2,070,609. Irving Elkin Muskat, Chicago, Ill., to du Pont, Wilmington, Del.

Recovery substantially water-free acetone-benzol from oil and wax fractions. No. 2,070,611. Wm. A. Myers, Springfield, Pa., to Atlantic Refining Co., Phila., Pa.

Production mercaptans. No. 2,070,761. Lajos von Szeszich, to Deutsche Gold-und Silber Scheideanstalt, both of Frankfort-am-Main, Germany.

Hydrogenation of alkyl phthalates. No. 2,070,770. Wm. John Amend to du Pont, both of Wilmington, Del.

Treatment of oakwood to produce a prolific growth of cryptogamic spores which promote oxidation, esterification, and aldehydation during the aging of spiritous liquors. No. 2,070,794. Ernst T. Krebs and Ernst T. Krebs, Jr., San Francisco, Calif.

Method preparing aliphatic ethers of arylamino-phenols; heating an aliphatic chloride with an arylaminophenol in an aqueous alkaline solution. No. 2,070,848. Waldo L. Semon, Silver Lake, and Robert V. Yoke, Akron, O., to B. F. Goodrich Co., New York City.

Apparatus for testing viscosity of liquids. No. 2,070,862. Clifford S. Healy, Chicago, Ill.

Process for packing catalytic reaction vessels. No. 2,070,868. Hosea H. Smith, Hamburg, N. Y., to National Aniline & Chemical Co., Inc., New York City.

Method of deoxidation control. No. 2,070,901. Anson Haynes and Jesse J. Canfield to American Rolling Mill Co., all of Middletown, O.

Method improving tobacco by use of an amyl alcoholic liquid. No. 2,070,957. Frederick H. Penn, Dallas, Texas.

Preparation liquid solvent composition consisting of ethylene dichloride and trichlorethylene. No. 2,070,962. Ernest W. Reid, Pittsburgh, Pa., to Union Carbide & Carbon Corp., New York City.

Production acid amides; reacting an ester of an aliphatic monobasic carboxylic acid and a polyhydric alcohol with liquid anhydrous ammonia. No. 2,070,991. Walter J. Hund, Oakland, and Ludwig Rosenstein, San Francisco, Calif., to Shell Development Co., San Francisco, Calif.

Method of and apparatus for drying material in sheet or web form. No. 2,071,015. Bernard R. Andrews, Braintree, Mass.

Preparation aryl phosphoric acid halides. No. 2,071,017. Shailer L. Bass to Dow Chemical Co., both of Midland, Mich.

Production a hollow gel cellulosic pellicle adapted to shrink by loss of contained water, having incorporated therein a white, insoluble metal titanate and being dyed with a direct dyestuff. No. 2,071,024. Percy Morgan Clark, New Brunswick, N. J., to du Pont, Wilmington, Del.

Process nitrating ethane; producing contact between ethane and nitric acid with both reagents in the gas or vapor phase. No. 2,071,122. Henry B. Hass, West Lafayette, and Edw. B. Hodge, Terre Haute, Ind., to Purdue Research Foundation, West Lafayette, Ind.

Recovery metal values from a mixture of sodium, calcium, and oxide, introducing mixture into a fused mixture of sodium-chloride and calcium chloride. No. 2,071,124. Robt. Edw. Hulse, Niagara Falls, N. Y., to du Pont, Wilmington, Del.

Method and apparatus for heating and deaerating liquids. No. 2,071,134. John R. McDermet, Jeannette, Pa., to Elliott Co., Pittsburgh, Pa.

Coloring bronze powders. No. 2,071,156. Max Baer to Henry M. Baer, both of New York City.

Preparation a synthetic linear condensation polymer capable of being drawn into pliable, strong fibres showing by characteristic X-ray patterns orientation along the fibre axis. No. 2,071,250. Wallace H. Carothers, Pennsbury Township, Chester Co., Pa., to du Pont, Wilmington, Del.

Production a synthetic linear polyacetyl obtained by a condensation reaction between a glycol and an acetal of a monohydric alcohol having a greater molecular weight than 10,000. No. 2,071,252. Wallace H. Carothers to du Pont, both of Wilmington, Del.

Production linear condensation polymers. No. 2,071,253. Wallace H. Carothers to du Pont, both of Wilmington, Del.

Separation of amino-acids readily soluble in water and ammonium sulfate. No. 2,071,282. Wilhelm Gluud and Walter Klempt to Bergwerksverband zur Verwertung von Schutzrechten der Kohlentechnik G. m. b. H., both of Dortmund-Eving, Germany.

Oil gasification process and apparatus. Nos. 2,071,285. Alfred Johnson, West New Brighton, N. Y., to Combustion Utilities Corp., New York City.

Cyclic process for making combustible gas. No. 2,071,286. Alfred Johnson, West New Brighton, N. Y., and Chas. E. Hemminger, Westfield, N. J., to Combustion Utilities Corp., New York City.

Production substantially pure monomethylamine and dimethylamine from mixtures containing mono- di- and trimethylamines, ammonia, and water. No. 2,071,301. Paul Herold and Karl Smeykal, Leuna, Germany, to I. G., Frankfort-am-Main, Germany.

Solid CO_2 cake-forming machine. No. 2,071,302. Reuben Hill, Detroit, Mich., to Albert J. Smith, Richmond Hill, N. Y.

Leather and Tanning Artificial Leather

Apparatus and process of manufacturing artificial leather or the like. No. 2,069,257. Ernst Mahler, Neenah, and John B. Catlin, Appleton, Wis., to Paper Patents Co., Neenah, Wis.

Process dyeing leather; using an acid solution of methanol, and an aqueous solution of basic chromium sulfate and cream of tartar. No. 2,069,925. Geo. R. Pensel, Amsterdam, N. Y.

Metals and Ores, Electroplating, etc.

Apparatus for recovery of values from aluminum. No. 2,068,640. Allen F. Baumbauer and Wm. Culver, Long Beach, Calif., said Culver assignor to Baumbauer.

Apparatus for production of light metals. No. 2,068,681. Robt. Edwin Hulse and Russell Leo Hardy, Niagara Falls, N. Y., to du Pont, Wilmington, Del.

Method of recovering compounds from zinc and lead ores. No. 2,068,690. Thos. A. Mitchell, Inglewood, Calif., to Hughes-Mitchell Processes, Inc., Denver, Colo.

Method decarburizing, deoxidizing, and degasifying molten iron and steel alloys. No. 2,068,785. Edgar C. Bain and Herbert Gruber, Hanau-am-Main, Germany, to U. S. Steel Corp., a corporation of N. J.

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Process for rapid recarburizing of pig iron melted in a cupola furnace. No. 2,068,793. Hans Frauenknecht, Genoa, Italy.

Production copper alloy amenable to heat treatment; free of beryllium, containing manganese and phosphorus. No. 2,068,817. Ulrich Raydt, Klaus Hanser, and Max Venzlaff to Firma Osnabrücker Kupfer-und Drahtwerk, all of Osnabruck, Germany.

Method and apparatus for treatment of ores and generation of gas. No. 2,068,842. James A. Bradley, Pittsburgh, Pa.

Production a non-brittle, galvanized, ferrous metal article. No. 2,068,904. Albert F. Bradley to Northwestern Barb Wire Co., both of Sterling, Ill.

Production nitrogen-containing rustless iron and steel of fine grain structure. Nos. 2,069,203-4. Wm. B. Arness to Rustless Iron & Steel Corp., both of Baltimore, Md.

Production iron-chromium alloys of appreciable nitrogen contents. No. 2,069,205. Wm. B. Arness to Rustless Iron & Steel Corp., both of Baltimore, Md.

Method and apparatus for recovering precious metal from ore. No. 2,069,206. Frank C. Axtell, Pasadena, Calif., three-fourths to Harold Whealton, Los Angeles, Calif.

Manufacture steel roll composition; composed of a ferrous body containing carbon, chromium, vanadium, and molybdenum, said part having a nitride-hardened surface. No. 2,069,260. Wm. J. Merten, Pittsburgh, Pa., to Nitralloy Corp., corporation of Delaware.

Production thermionic cathode. No. 2,069,407. Gorton R. Fonda to General Electric Co., both of Schenectady, N. Y.

Production ferrous alloy containing silicon, carbon, and iron. No. 2,069,423. Harry A. Schwartz, Cleveland Heights, Ohio, to National Malleable & Steel Castings Co., Cleveland, Ohio.

Production metals and alloys with very small contents of carbon. No. 2,069,469. Gustav Andersen, Copenhagen, Denmark.

Method finishing surfaces in simulation of napped cloth; *i.e.*, burial caskets, interior automobile bodies, etc.; applying coating of viscous material consisting of polyhydric alcohol-polybasic acid resin, pigment, cobalt naphthenate, mineral spirits, turpentine, xylol. No. 2,069,470. Guido Ariotti, Stamford, Conn., to Atlas Powder Company, Wilmington, Del.

Nickel plating solutions and processes. No. 2,069,566. Robert L. Tuttle, Woodbridge, N. J., to Zialite Corp., corporation of N. Y.

Method coating ferrous strip metal and product thereof. No. 2,069,658. Robt. F. Renkin, Sharon, Pa., to himself, to Henry A. Roemer and John M. Hughes, both of Youngstown, O.

Manufacture of metallic glucinum and its alloys. No. 2,069,705. Robt. Andre Gadeau, St. Jean de Maurienne, France, to Compagnie de Produits Chimiques et Electrometallurgiques Olais, Froges et Camargue, Paris, France.

Production malleable iron; comprising carbon, silicon, manganese, and iron. No. 2,069,717. Rex A. Edmunds, Detroit, Mich., to National Malleable & Steel Castings Co., Cleveland, Ohio.

Manufacture forged corrosion-resistant iron or steel turbine blade, comprised of carbon, chromium, molybdenum, and iron. No. 2,069,718. Alex. L. Feild to Rustless Iron & Steel Corp., both of Baltimore, Md.

Production iron or mild steel free from blue brittleness and free from tendency to redevelop a definite yield point after the yield point has once been destroyed. No. 2,069,758. Anson Hayes and Ralph O. Griffis, to American Rolling Mill Co., both of Middletown, O.

Manufacture carbonaceous electrode having its pores filled with chlorinated material. No. 2,069,862. Masutaro Suzuki, Itabashi-ku, Tokyo, Japan, to Asahi Denka Kogyo Kabushiki Kaisha, Tokyo, Japan.

Apparatus and process of roasting ores. No. 2,069,875. Carl Paul Debuch and Ernst Markworth, Frankfort-am-Main, Germany, to American Lurgi Corp., New York City.

Manufacture welding rod composed of copper, antimony, a deoxidizing agent, an addition agent, tin, and arsenic. No. 2,069,906. Eugen Vaders, Frankfort-am-Main, Germany.

Separation of molybdenite from copper sulfides. No. 2,070,076. Earl H. Brown, Palo Alto, Calif., to Minerals Separation No. Amer. Corp., New York City.

Method condensing zinc vapor. No. 2,070,101. Geo. F. Weaton and Herand K. Najarian, Beaver, Pa., to St. Joseph Lead Co., New York City.

Flotation of cement copper. No. 2,070,133. Harmon E. Keyes, Miami, Ariz.

Preparation and use of iron as a precipitant. No. 2,070,134. Harmon E. Keyes, Miami, Ariz.

Process forming an oxidizing reagent for use in the refining of metallic material. No. 2,070,185. Gilbert E. Seil, Cynwyd, Pa., to Buffalo Electric Furnace Corp., Buffalo, N. Y.

Process making metal alloys. No. 2,070,186. Gilbert E. Seil, Cynwyd, Pa., to Buffalo Electric Furnace Corp., Buffalo, N. Y.

Apparatus and process for manufacture of multi-colored filaments. No. 2,070,194. Richard Bartunek, Johann Jos. Stoeckly, both of Teltow-Seehof, near Berlin; August Hartmann, Johannes Uytenbogaart, both of Berlin-Lichterfelde, Germany, to North American Rayon Corp., corporation of Del.

Method roasting metal sulfide fines to produce sulfur dioxide. Nos. 2,070,235-7. Edwin J. Mullen, New Rochelle, N. Y., to General Chemical Co., New York City.

Production hard metal alloy. No. 2,070,451. Alan Richard Powell and Ernest Robert Box to Johnson Matthey & Co., Ltd., all of London, England.

Production zinc alloy, composed of aluminum, lead, copper, and zinc. No. 2,070,474. Aldo Dacco, Milan, Italy.

Process obtaining manganese values from carbonate ores. Nos. 2,070,496-7. Andrew T. Sweet, Houghton, Mich., and John D. MacCarthy, Detroit, Mich., to General Manganese Corp., Detroit, Mich.

Apparatus for screening ore. No. 2,070,530. Chas. A. Gallagher and Carl M. Allen, California, Pa., to General Chemical Co., New York City.

Apparatus for roasting ore. No. 2,070,531. Chas. A. Gallagher and Carl M. Allen, California, Pa., to General Chemical Co., New York City.

Preparation molded artificial resin articles for electroplating; using a varnish, a metal alloy powder, and a copper acid bath in process. No. 2,070,679. Rudolf Pebock and Kurt Bergstein, Berlin, Germany.

Mold for casting metallic magnesium and its alloys. No. 2,070,821. Frederick Badger, Point Pleasant, Wandsworth, London, England, to Magnesium Castings and Products, Ltd., Slough, Bucks, Great Britain.

Method treating aluminum alloy and product. No. 2,070,833. Fred Keller and Chas. M. Craighead, New Kensington, Pa., to Aluminum Co. of America, Pittsburgh, Pa.

Brightening metals electro-negative to iron; subjecting surface to action of a solution of an oxy-acid of a pentavalent halogen. No. 2,070,871. David B. Stockton to Udylite Co., both of Detroit, Mich.

Precious metal alloys; alloy composed of gold, platinum, and palladium. No. 2,071,216. Alan Richard Powell and Ernest Robt. Box to Johnson Matthey & Co., Ltd., all of London, England.

Device for recovery of gold or other noble metals in dispersed phase in a fluid suspension. No. 2,071,260. Chas. Revell Holden, Chicago, Ill.

Naval Stores and Derivatives

Method of refining rosin; using an organic thiocyanate in process. No. 2,069,992. Jos. N. Borglin to Hercules Powder Co., both of Wilmington, Del.

Apparatus for refining rosin. No. 2,070,125. Roy S. Hancock, Kenvil, N. J., and Arthur Langmeier, Wilmington, Del., to Hercules Powder Co., Wilmington, Del.

Paper and Pulp

Manufacture paper; adding to fiber-mix, before formation of a paper web therefrom, a water-dispersible, water-imbibing polar-molecule derivative of a water-imbibing non-polar-molecule gum. No. 2,069,766. Thos. R. Le Cempte, Pittsburgh, Pa., to John A. Manning Paper Co., Green Island, N. Y.

Production coated paper. No. 2,069,786. Peter A. van der Meulen to John R. Ditmars, both of New Brunswick, N. J.

Method of treating pulp mill waste cooking liquors. No. 2,070,632. Geo. H. Tomlinson, Montreal, Que., Canada.

Apparatus for making pulp or the like. No. 2,070,742. Homer D. Martindale, Middletown, Ohio, to Black-Clawson Co., Hamilton, Ohio.

Chemical process for improving color of wood pulp. No. 2,070,893. Hugh Bryson Glass, Birmingham, Ala.

Manufacture products of ground wood pulp; using a salt of hydrosulfurous acid in process. No. 2,071,304. Wilhelm Hirschkind, Berkeley, Calif., to Great Western Electro-Chemical Co., corporation of Calif.

Chemical bleaching of ground wood pulp. Nos. 2,071,305-6-7. Wilhelm Hirschkind, Berkeley, Calif., to Great Western Electro-Chemical Co., corporation of Calif.

Bleaching chemical wood pulp. Nos. 2,071,308-9. Wilhelm Hirschkind, Berkeley, Calif., to Great Western Electro-Chemical Co., corporation of Calif.

Petroleum and Petroleum Derivatives

Preparation solvents; subjecting a "hydroformed solvent" prepared by destructive hydrogenation of hydrocarbon oils. No. 2,068,834. Carl Winning, Elizabeth, N. J., to Standard Oil Development Co., a corporation of Del.

Manufacture hard bituminous materials. No. 2,068,845. John Oliver Collins, Cranford, N. J., to Standard Oil Development Co., corporation of Del.

Treatment petroleum oil. No. 2,068,847. Garland H. B. Davis and Jones I. Wasson, Elizabeth, N. J., to Standard Oil Development Co., corporation of Del.

Process of improving gasoline. No. 2,068,850. Carleton Ellis, Montclair, N. J., to Standard Oil Development Co., corporation of Del.

Treating oxygenated organic compounds. No. 2,068,854. Per K. Frolich, Roselle, N. J., to Standard Oil Development Co., corporation of Del.

Combined still and coil cracking; method of cracking petroleum. No. 2,068,856. Frank A. Howard, Elizabeth, N. J., to Standard Oil Development Co., corporation of Del.

Preparation motor fuel blend. No. 2,068,857. Frank A. Howard, Elizabeth, N. J., to Standard Oil Development Co., corporation of Delaware.

Prevention corrosion in oil stills; by supplying to oils being distilled a small part of an oil-soluble naphthenate of an alkali earth metal. No. 2,068,979. Gerald M. Fisher, Los Angeles, Calif., to Socony-Vacuum Oil Co., Inc., New York City.

Process refining a viscous hydrocarbon lubricating distillate containing paraffin and petrolatum wax. No. 2,069,170. Wm. J. McGill, Alton, Ill., to Standard Oil Co., Chicago, Ill.

Process separating normally gaseous unsaturated hydrocarbons from normally gaseous saturated hydrocarbons. No. 2,069,172. Clarke C. Miller, Wood River, Ill., to Standard Oil Co., Chicago, Ill.

Process refining hydrocarbon gases. No. 2,069,173. Clarke C. Miller, Wood River, Ill., to Standard Oil Co., Chicago, Ill.

Conversion of hydrocarbon oils. No. 2,069,191. Harold V. Atwell, White Plains, N. Y., to Process Management Co., Inc., New York City.

An oil of low sludging tendency; comprising a wax-free petroleum lubricating oil with a sludge dispersion agent which comprises a heavy fluid synthetic hydrocarbon. No. 2,069,273. Raphael Rosen, Cranford, N. J., to Standard Oil Development Co., corporation of Del.

An improved lubricating oil of reduced sludging tendencies. No. 2,069,274. Raphael Rosen, Cranford, N. J., to Standard Oil Development Co., corporation of Del.

Hydrocarbon oil conversion. No. 2,069,358. Carbon P. Dubbs to Universal Oil Products Co., both of Chicago, Ill.

Production gasoline from hydrocarbon charging oil, which is relatively light and refractory to cracking. No. 2,069,392. Jean Delattre Seguy to Universal Oil Products Co., both of Chicago, Ill.

Method whereby fuel oil may be treated to produce more valuable hydrocarbon products. No. 2,069,596. Albrecht von Groeling, Los Angeles, Calif.

Manufacturing residual oils of high asphaltic content. No. 2,069,620. Henry G. Nevitt, Kansas City, Mo., to Socony-Vacuum Oil Co., Inc., New York City.

Conversion of hydrocarbons. No. 2,069,785. Hans Tropsch to Universal Oil Products Co., both of Chicago, Ill.

Production lubricant comprising a hydrocarbon lubricant material and a chloro derivative of retene. No. 2,069,790. Eric Wahlforss, Cleveland, Carl L. Johnson, Bedford, and Geo. Lacy, Cleveland, Ohio, to Glidden Co., Cleveland, O.

Method coking hydrocarbon material. No. 2,069,815. Arthur J. Boynton, Winnetka, Ill., to Brassert-Tidewater Development Corp., Chicago, Ill.

Process improving antidetonating quality of gasoline. No. 2,069,847. Arthur E. Pew, Jr., Bryn Mawr, Pa., to Sun Oil Co., Phila., Pa.

Compositions of matter; comprising a fluxed, homogeneous, stable tar product containing pyrogenous distillate tar and a low-boiling cracked petroleum product. No. 2,069,927. Edmund O. Rhodes, Pittsburgh, and Hugh E. Gillander, Jr., to Koppers Co., corporation of Del.

Manufacture solid lubricants. No. 2,070,014. Bert H. Lincoln and Ernest W. Nelson to Continental Oil Co., all of Ponca City, Okla.

Method of separating and purifying gases. No. 2,070,099. Lee S. Twomey, Vista, Calif.

Process of decomposing relatively high boiling point oils into relatively low boiling point oils. No. 2,070,124. Ralph A. Halloran and Archie L. Strout, Berkeley, Calif., to Universal Oil Products Co., Chicago, Ill.

Conversion of hydrocarbon oils. No. 2,070,249. Charles H. Angell to Universal Oil Products Co., both of Chicago, Ill.

Treatment hydrocarbon oils. Nos. 2,070,294-5. Jacque C. Morrell to Universal Oil Products Co., both of Chicago, Ill.

Cracked motor fuel containing a material selected from the class of benzamide and phthalamide. No. 2,070,304. Alphons O. Jaeger, Mt. Lebanon, Pa., to American Cyanamid & Chemical Corp., New York City.

Production lubricating oil of viscosity suitable for internal combustion engines. No. 2,070,383. Malcolm Harley Tuttle, New Rochelle, N. Y., to Max B. Miller & Co., Inc., New York City.

Refining a mineral oil by means of liquefied propane and a separable naphthenic solvent. No. 2,070,384. Malcolm H. Tuttle, New Rochelle, N. Y., to Max B. Miller & Co., Inc., New York City.

Process extracting a mineral oil by means of paraffinic and naphthenic solvents jointly employed. No. 2,070,385. Malcolm H. Tuttle, New Rochelle, N. Y., to Max B. Miller & Co., Inc., New York City.

Lubricating oil refining. No. 2,070,567. Chester E. Adams, Hammond, Ind., to Standard Oil Co., Chicago, Ill.

Method of reclaiming used crank-case lubricating oils. No. 2,070,626. Bernard H. Shoemaker, Hammond, Ind., to Standard Oil Co., Chicago, Ill.

Oxidation refining of lubricating oil. No. 2,070,627. Bernard H. Shoemaker, Hammond, Ind., to Standard Oil Co., Chicago, Ill.

Conversion hydrocarbon oils. No. 2,070,680. Albert G. Peterkin, Jr., Bryn Mawr, Pa., to Atlantic Refining Co., Phila., Pa.

Process for making a sharp separation of a high vapor pressure solvent and a low pressure hydrocarbon oil from a feed mixture. No. 2,070,864. Edw. G. Ragatz to Union Oil Co. of Calif., both of Los Angeles, Calif.

Treatment cracked petroleum distillates. No. 2,070,978. John P. Smoots, Shaker Heights, O., to Standard Oil Co., Cleveland, O.

Conversion of a halogenated polyhydric alcohol to an oxy compound containing fewer halogen atoms. No. 2,070,990. Herbert P. A. Groll, Oakland, and Geo. Hearne, Berkeley, Calif., to Shell Development Co., San Francisco, Calif.

Stabilization of motor fuels. No. 2,071,064. Frederick Baxter Downing, Carneys Point, N. J., and Richard Gesse Clarkson, Wilmington, Del., to du Pont, Wilmington, Del.

Resins, Plastics, etc.

Manufacture water-resisting molding mixtures containing a resin of the urea-formaldehyde type. No. 2,068,974. Walter Brandenberg, Passaic, N. J., to Heyden Chemical Corp., New York City.

Preparation resinous condensation products containing urea or its derivatives. No. 2,069,117. Fritz Seebach, Erkner, near Berlin, Germany, to Bakelite Corp., New York City.

Method dispersing resins and composition produced thereby. No. 2,069,178. Harry M. Dent, Buffalo, Sydney H. Hall, Kenmore, and Lothar A. Sontag, No. Tonawanda, N. Y., to General Plastics, Inc., No. Tonawanda, N. Y.

Preparation phenolic compounds; a condensation product of a naphthanone and a mononuclear monohydric phenol whose para position to the phenolic hydroxyl is unoccupied. No. 2,069,275. Henry S. Rothrock to du Pont, both of Wilmington, Del.

Production inlaid fibrous bodied articles, using a thermoplastic during process. No. 2,069,393. Edward C. Sloan to Jesse B. Hawley, both of Geneva, Ill.

Removal wax and resins from shellac by treatment with a cyclic hydrocarbon and water. No. 2,069,533. Leon McCulloch, Pittsburgh, Pa., to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Purification resinous material suitable for use in chewing gum. No. 2,070,047. Geo. A. Hatherell, Burbank, Calif., to Frank A. Garbutt, Los Angeles, Calif.

Preparation phenolic resinous products and compositions containing them. No. 2,070,148. Victor H. Turkington, Caldwell, and Wm. H. Butler, Arlington, N. J., to Bakelite Corp., New York City.

Preparation of grinding or polishing tools, using resins in process. No. 2,070,158. Ernst Elbel and Otto Sussenguth, Erkner, near Berlin, Germany, to Bakelite Corp., New York City.

Manufacture thermoplastic product. No. 2,070,242. Wilbur F. St. Clair to Celluloid Corp., both of Newark, N. J.

Apparatus and process of producing seamless, flexible tubing; using a plastic material in process. No. 2,070,247. Richard Weingand and Arnold Muchlinski, Bomlitz, near Walsrode, Germany, to Sylvania Industrial Corp., Fredericksburg, Va.

Production nitrocellulose pellicles having a matte appearance. No. 2,070,248. Richard Weingand and Arnold Muchlinski, Bomlitz, near Walsrode, Germany, to Sylvania Industrial Corp., Fredericksburg, Va.

Plastic material having greater strength and toughness at low temperatures, etc. No. 2,070,331. Elmer R. Derby, Springfield, and Gustavus J. Esselen, Swampscott, Mass., to Fiberloid Corp., Indian Orchard, Mass.

Method curing poly vinyl halides; mixing polymerized vinyl chloride, a plasticizer, and a water soluble sulfide in presence of water, then heating. No. 2,070,443. Randolph W. McGahey, Akron, Ohio, to B. F. Goodrich Co., New York City.

Method coating surfaces of non-thermoplastic fabric with layers of thermoplastic compositions. No. 2,070,600. Henry Jenett, Englewood, N. J., to Celanese Corp. of America, corporation of Del.

Method decolorizing a resin obtained by the polymerization of crude coal tar naphtha under the influence of an acidic polymerizing agent, using clay in process. No. 2,070,694. Chas. A. Thomas and Wm. H. Carmody, Dayton, O., to Neville Co., Neville Island, Pittsburgh, Pa.

Preparation synthetic resin which is soluble in vegetable oils; using a drying oil which has been previously heat-treated, a monoglyceride of a drying oil acid, and phthalic anhydride. No. 2,071,312. Sydney Leonard Morgan Saunders, London, England.

Synthetic resin composition; using glycerol, phthalic anhydride, and a monoglyceride of a drying oil acid. No. 2,071,313. Sydney Leonard Morgan Saunders, London, England.

Rubber

Manufacture vulcanized rubber products; using hydroxyquinol in process. No. 2,068,935. Albert A. Somerville, Flushing, N. Y., to R. T. Vanderbilt Co., Inc., New York City.

Vulcanizing rubber by heating it in presence of a vulcanizing agent and lead bornyl-xanthogenate. No. 2,069,053. John E. Whittenberg, to Firestone Tire & Rubber Co., both of Akron, O.

Alkali digestion process of reclaiming scrap rubber; digesting with heat a mixture of scrap rubber, water, caustic soda and an oxidizing agent. No. 2,069,151. John P. Ioannu to Penn Salt Mfg. Co., both of Philadelphia, Pa.

Manufacture chlorinated rubber. No. 2,069,262. Terence Neil Montgomery, Runcorn, England, to Imperial Chemical Industries, Ltd., London, England.

Accelerator of vulcanization; rubber product which has been vulcanized in presence of an amine. No. 2,070,524. Howard I. Cramer, Cuyahoga Falls, O., to Wingfoot Corp., Wilmington, Del.

Apparatus for treating plied sheet material. No. 2,071,048. Frank S. Sternad, Cuyahoga Falls, O., to B. F. Goodrich Co., New York City.

Manufacture rubber compositions from latex and like aqueous rubber dispersions. No. 2,071,214. Ugo Pestalozza to Societa Italiana Pirelli, both of Milan, Italy.

Textiles, Rayon

Manufacture printed textile fabric No. 2,068,770. Alfred M. Schwarzschild, Berlin, Germany.

Process printing textiles with vat dyestuffs; applying dyestuff to fiber in presence of an alkali-soluble salt of a branched-chain aliphatic carboxylic acid. No. 2,069,215. Ivan Fleming Chambers to du Pont, both of Wilmington, Del.

Process treating textiles and product thereof. No. 2,069,303. Camille Dreyfus, New York City, and Wm. Whitehead, Cumberland, Md., to Celanese Corp. of America, corporation of Del.

Apparatus and method of scouring and dyeing. No. 2,069,311. Thos. Harvey Hilliard, Drummondville, Que., Canada, to Celanese Corp. of America, corporation of Del.

Apparatus for applying coating or filling material to a fabric. No. 2,069,322. Albert Mellor and Ralph Jas. Mann, Spondon near Derby, England, to Celanese Corp. of America, a corporation of Del.

Production printed textiles having vat and azo colors in same pattern. No. 2,069,919. Richard Walter Hardacre, and Alec Wormald, Blackley, Manchester, England, to Imperial Chemical Industries, Ltd., London, England.

Manufacture or treatment of yarns or filaments. No. 2,069,971. Geo. Schneider, Montclair, N. J., to Celanese Corp. of America, corporation of Del.

Manufacture lustreless yarn from cellulose acetate. No. 2,070,031. Herbert G. Stone and Henry R. Childs, Kingsport, Tenn., to Eastman Kodak Co., Jersey City, N. J.

Method scouring and bleaching textiles of the animal fiber group; using an alkaline hydrogen peroxide aqueous solution. No. 2,070,210. Lindsey H. Mason, Bala-Cynwyd, Pa.

Apparatus for treating rayon in cake form. No. 2,070,538. Thos. McConnell, Northampton, Mass., to Hampton Co., Easthampton, Mass.

Production of shrinkage effects on textile containing cellulose derivatives. No. 2,070,583. Wm. Alex. Dickie and Percy Frederick Combe Sowter, Spondon, near Derby, England, to Celanese Corp. of America, corporation of Del.

Apparatus and process for treating threads, etc., with liquids. No. 2,070,715. Henry Dreyfus, London, England.

Carroting fur process; using solution containing permanganate and nitric or sulfuric acid. No. 2,070,927. Jack D. Sartakoff, Elmhurst, N. Y.

Manufacture artificial synthetic fibers by forming a linear condensation polymer having molecular weight of at least 10,000 into filaments and "cold-drawing" filaments. No. 2,071,251. Wallace H. Carothers to du Pont, both of Wilmington, Del.

Water Treatment

Apparatus for analysis of chemically purified water. No. 2,069,562. Armand Schnorf, Saint-Aubin, Neuchatel, Switzerland.

Stabilizing a humic acid base exchange material. No. 2,069,564. Howard L. Tiger, New York City, and Paul C. Goetz, Mount Holly, N. J., to Permutit Co., New York City.

Water purification process. No. 20,261. Reissue. Ralph A. Stevenson, San Marino, Calif., to Great Western Electro-Chemical Co., San Francisco, Calif.

Purification of sewage water with hydrogen peroxide. No. 2,070,856. Elmore E. Butterfield, Forest Hills, N. Y.

Ammonia For Phenol Extraction

Phenols are recovered from oils, tars, and the like by extracting with aqueous ammonia, the density of which has been materially raised by one or more dissolved substances, followed by separation of the ammoniacal liquor from the oil, and removal of the ammonia from the liquor. Substances specified are the nitrates of lithium, sodium, potassium, ammonium, calcium, and strontium, sodium nitrite, chloride or bromide and calcium chloride. The formation of a non-volatile residue on distilling the phenols obtained by this process is avoided by stripping the ammonia from the aqueous phenol extract and/or treating the separated phenols with carbon dioxide and removing the solid carbonates. The most effective concentration of ammonia is 30% or more, and saturated solutions of the salt or salts are preferably used. The ammonia may be removed by heating, or, alternatively, by subjecting the liquor to a vacuum or blowing with an inert gas, with or without heating. By removing the ammonia in stages, the phenols may be fractionated. The ammonia evolved may be absorbed in stripped liquor from which the phenols have been separated, and the heat of absorption utilized in a heat-exchanger for removing ammonia from a further quantity of ammoniacal phenolic liquor, the whole process being preferably carried out in a continuous manner. The reaction is preferably carried out at normal temperature. In an example, a naphtha fraction is washed with 3 successive washes of an equal volume of sodium nitrate-ammonia solution. English Patent 457,139 and controlled by Imperial Chemical Industries, digested in British, *The Chemical Trade Journal*, Feb. 12, '37, p151.

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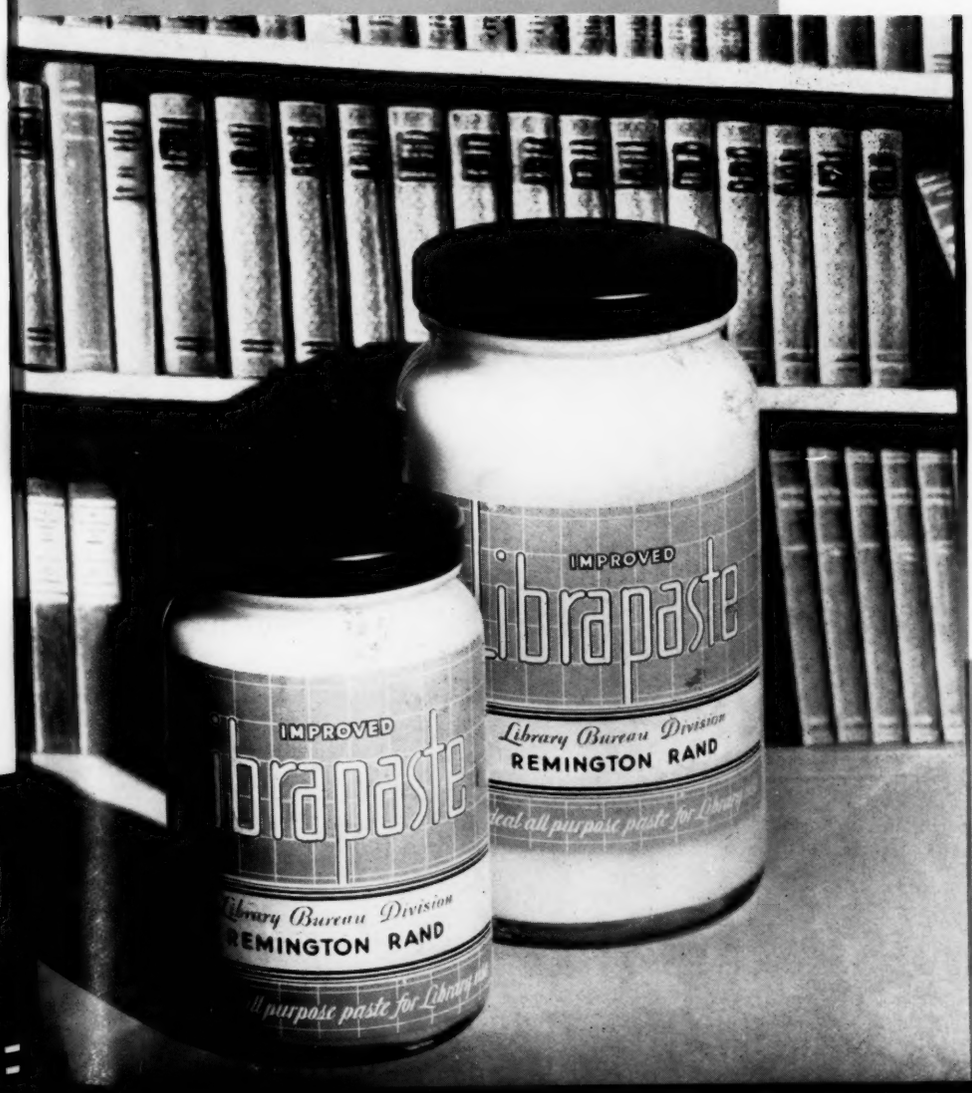

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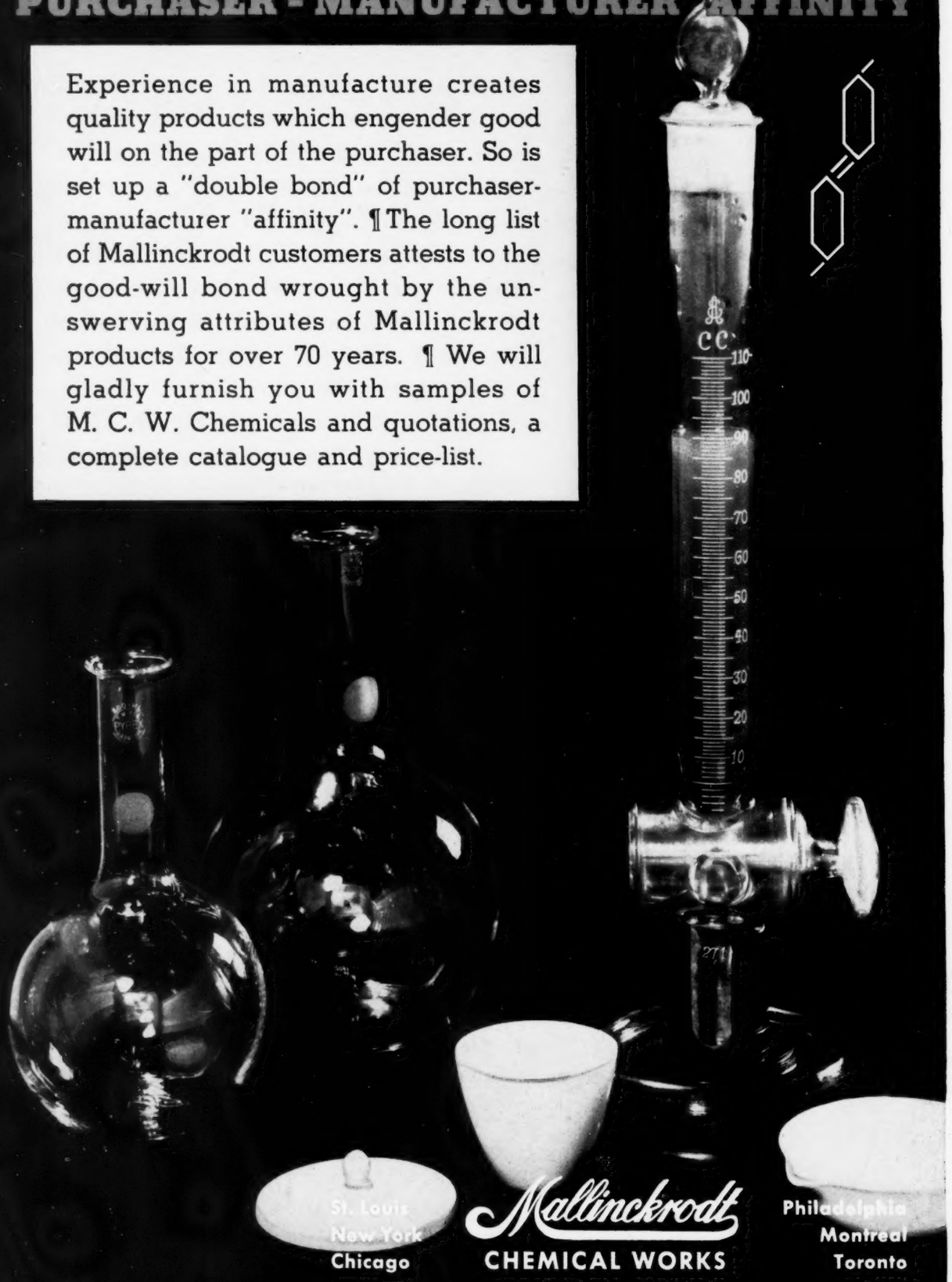

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CHLORPICRIN

Its Widening Commercial Use, Characteristics and Advantages

By Conrad C. Johnson

Manager, Insecticide Division, Innis, Speiden & Co.

TWENTY years ago the usual fumigants were carbon bisulfide and hydrocyanic acid gas, both of which left much to be desired. Carbon bisulfide carried with it an ever-present fire and explosion hazard, while hydrocyanic acid gas, because of its quick action and lack of warning qualities, endangered human life.

A Tear Jerking War Baby

With the rising demand for sanitation by fumigation, an effective gas without these dangers was needed. At that time chlorpicrin was largely known to the scientific world as a tear-gas material for war purposes, a gas that frequently penetrated the gas masks then available.

Experimentation following the War brought out the high unit toxicity of chlorpicrin to insects. Among commercial fumigants this degree of toxicity was approached only by hydrocyanic acid. Becoming available commercially in this country during 1925, it was gradually adopted, first by the milling and grain industry as a powerful yet comparatively safe fumigating agent. Today it has acceptance in practically every field where gas control of insects or rodents is practised.

For a time the objection was raised in certain quarters that chlorpicrin did not "air out" readily. With a study of application methods this former difficulty has been reduced to a minimum, and now, generally speaking, it is found not to be a commercial handicap. In fact, it may be said that all fumigants require some definite time to air out of spaces and products, depending upon temperature, humidity, air movement and the like, during which period they may constitute a hazard. Chlorpicrin has the great advantage of giving unmistakable warning of its presence in dangerous amounts.

Here are a few of chlorpicrin's commonly accepted physical and chemical characteristics:

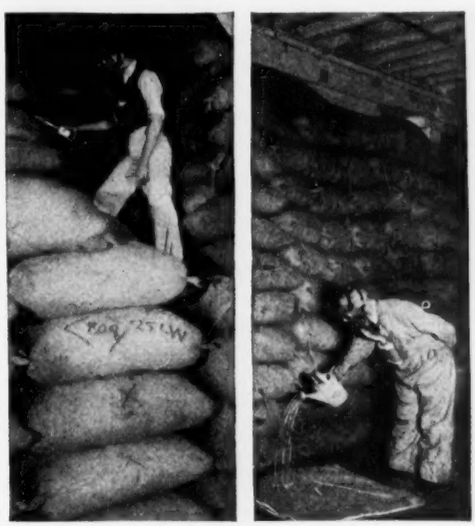
Formula (trichloronitromethane)	CCl_3NO_2
Molecular weight	164.38
Theoretical specific gravity of vapor (air = 1)	5.7
Boiling point	112.4° C.
Freezing point	—64° C.
Vapor pressure[1]	0° C. — 5.7 mm Hg
	20° C. — 18.3 mm Hg
Solubility in water[2]	2.272 gr. per liter at 0° C.
Heat of vaporization[1]	6.77 kg. calories per gram molecule at 35° C.
Refractive index[3]	$n_{D_t}^{20°}$ 1.4595

In commercially pure form the liquid is colorless. Surface tension is low, there being about 118 drops to the cc. It weighs 13¾ lbs. to the gallon. While the theoretical density of the vapor is 5.7 as compared to air, it should be remembered that the density of an air-gas mixture at the saturation point is only 1.1458 (25° C. and 760 mm Hg pressure).[4] Chlorpicrin has no flash point,[5] and is soluble in the usual organic solvents. It has no bleaching or other harmful effect on textiles and furs.[6]

Sounds Its Own Siren

Its most noticeable characteristic is the lachrymatory effect. In the average person the threshold of consciousness, represented by a slight blinking of the eyes, is 1 ppm. At 2 or 3 ppm tears are produced. As the concentration increases, irritation of the membranes in nose, throat and bronchial tubes occur progressively, accompanied by such reaction as coughing.[7]

Use of hand compressor sprayer with chlorpicrin in treating mill machinery for insects.



Chlorpicrin fumigation in food storage warehouses showing use of sprinkler bottle and watering can.

Experimental work indicates the limit of voluntary toleration for a two-minute period as about 22 ppm. The lowest lethal concentration for dogs has been given as over 120 ppm for a half hour exposure, with death in from 4 to 66 hours.[7] Death among experimental animals is due either directly or indirectly to lung oedema resulting from the intensive irritation of the alveolar walls. Thus it appears that chlorpicrin is far from being a rapid poison, which fact would be a valuable safety element in case of severe exposure. Furthermore, it is believed that even the war cases showed no permanent disability as the result of exposure to this gas alone.[8]

Chlorpicrin has been found to be remarkably toxic to the lower forms of life, such as fungi and bacteria. Much still remains to be done in this field, but it may be of interest to note the conditions under which some investigators have found it effective, as follows:

Organism	*Dosage per 1000 ft.*[3]	*Exposure*
[9] Black plague bacilli	½-1 lb.	48 hrs.
[10] Koch bacilli	Saturated atmosphere	24 hrs.
[10] Anthrax spores	" "	6-14 hrs.
[11] B. typhosus	" "	3 hrs.
[11] Streptococcus	" "	6 hrs.
[12] Rod shaped plague bacilli	2 lbs.	30 mins.

From other observations it is believed the germicidal effect in most cases is secured considerably quicker than reported by the authorities quoted above.

Two Russian investigators express the opinion that the insecticidal and disinfectant properties are practically equal, a statement which cannot be discussed intelligently in the light of present knowledge in this country.[12]

Protection of Handlers

Probably due to its germicidal action, workers in the English factories filling chlorpicrin shells during the War epidemics were found to be practically immune to influenza. Only two per cent. to four per cent. of these workers contracted the flu while from 25 to 65 per cent. of the surrounding townspeople were affected.[13] This may be considered an indication that exposure to very low concentrations has less harmful effects on the average person than might be expected from a gas of this nature.

The toxicity of chlorpicrin in gas form as compared to some other fumigants may be judged from the following table. The dosages given are the ordinary commercial rates of application in a tight building, such as a warehouse, at a temperature of 80° F.

	Dosage per 1000 ft.[3]	*Percentage Gas Volume Concentration*
Chlorpicrin	1 lb.	0.24%
Hydrocyanic acid	½ lb.	0.72
Ethylene oxide	1½ lbs.	1.33
Carbon bisulfide	5 lbs.	2.6
Ethylene dichloride	10 lbs.	4.0

Naturally it is difficult to compare the toxicities of different fumigants in terms of a fixed index number because their relationship to each other continually varies with such factors as temperature, humidity, kind and amount of material present to be fumigated, and the natural resistance of the insects involved. For instance, Moore calculated that, molecule for molecule, chlorpicrin is 283 times as toxic as carbon bisulfide,[6] but the relationship in the above table would make it appear to be 11 to 1. Of the many methods that may be used to compare toxicities, this idea of basing the comparison on time-proven dosages under practical fumigating conditions has much to recommend it.

In commercial fumigation work one of the helpful phenomena of chlorpicrin is its penetrating ability. At the proper concentration for the quantity of material present, it kills insect life in all stages throughout 140 lb. sacks of flour, standard cases of tobacco, and sacks of rice. In bulk grain it penetrates the berries to kill the weevil egg, larva and pupa hidden within. In experimental termite work it was the only fumigant among those tried by the California Termite Commission in vault work which killed all termite life in sections of telephone poles.[14]

An idea of commercial dosages with chlorpicrin at summer temperatures is given in the following tables:[15]

Rodents alone	Scant ¼ lb. per 1000 ft.[3]
Home Fumigation	1 lb. per 1000 ft.[3]
Tight warehouse, not fully loaded	1 lb. per 1000 ft.[3]
Vaults with sacked material	1½-3 lbs. per 1000 ft.[3]

In describing methods of application in fumigation work, the general statement may be made that the more finely the liquid is broken up the better assurance there is of success. Another point is that the liquid itself should be kept off absorbent surfaces, such as old wooden floors. At summer temperatures, quantity application today is usually by sprinkling with an ordinary watering can on empty burlap sacks spread out either underfoot or over the material to be fumigated. The men wear gas masks for comfort and protection. Several different styles of canisters may be used, but the style designed for acid gases and organic vapors is in widest general use.

Sprinkling on empty burlap sacks is inexpensive and simple, which accounts in large measure for its popularity. For small quantities, as in freight cars or vaults, there are many types of simple equipment such as sprinkler bottles (an ordinary ginger ale bottle equipped with a sprinkler cork as used for sprinkling clothes), hand compressor sprayers, blowers and atomizers. Chlorpicrin is adaptable to pipe line distribution through nozzles and such a system can be worked out when the need arises.

In treating bulk grain in bins of from a few thousand to over 100,000 bushels capacity, the liquid is fed into the grain stream at a uniform rate—a little over a pint for each thousand bushels.

Revolutionizing Mill Fumigation Methods

For controlling flour mill infestation, most fumigation programs are built around machinery treatment. The dosage of a few ounces to a pound in each machine is usually sufficient to build up a theoretical concentration in the system of 10-20 lbs. per 1000 ft.[3] which is more than enough to overcome the natural leakage and to kill all insect stages in the machinery. Seepage into the open space of the mill can be counted on to kill at least rodents and flying insects. This system using chlorpicrin has been recommended for many years. Its proven efficiency and economy has resulted in the adoption in most mill fumigation practice of treating machinery instead of general plant fumigation.

Chlorpicrin acts as an irritant to the insects and causes them to go into motion. A good example is in house fumigation where the moth larvae in an upholstered chair work their way to the surface where they are later found in large numbers. One commercial advantage of this action is in the fumigation of nuts where chlorpicrin forces to the outside any worms inside the nut meats. Thus it acts as an automatic "dewormer."

The lethal concentration for rats at various exposure times is given as follows:[16]

3 minutes	7.4 mg per liter
15 "	1.0 " " "
30 "	.5 " " "

Milligrams per liter are approximately avoirdupois ounces per 1000 ft.[3] Mice are even more easily killed. The usual commercial recommendation is a scant quarter of a pound per 1000 ft.[3] even when large quantities of sacked goods are present. Over-night exposure is usual, but the time can be cut to five hours with safety. A valuable feature is that chlorpicrin irritates the rodents to move from their hiding places to die in the open. This eliminates the nuisance of hidden carcasses. Reports are so frequent about lack of odor in the dead bodies that it is suspected the chlorpicrin may kill the organisms causing putrefaction.

As an illustration of its speed of action under favorable conditions, chlorpicrin has been found to kill the clothes louse and its eggs in a half hour when applied to clothing piled in a galvanized iron ash tin with a small amount of heat to hasten volatilization. The rate of application was 4 cc per ft.^{3} and the temperature 80° F. or higher. A five-minute airing period was found sufficient to remove the bulk of the chlorpicrin so the clothing could be worn at once.

Under-Cover Work in Agriculture

Soil treatment for the control of fungi, nematodes and other harmful soil organisms appears to hold real promise. In Hawaii it was found that 150-200 lbs. per acre brought about striking reductions in the nematode infestation and increased yields about 50%.[18] As it will kill plant life on contact, the chlorpicrin is applied through mulch paper about two weeks before planting.

Further scientific investigation should develop the technique of dosage and application for many greenhouse, seed bed, and field soil problems. Successful experiments indicate that a dosage of 3 to 6 fluid ounces per ton of soil in a tight box kills weed seeds, insects and many fungi. Harmful bacteria are apparently affected adversely with the result that seedlings get an excellent start. Fumigated mushroom soil has given an increase in yield of 75% by weight.

The lachrymatory effect of chlorpicrin has been taken advantage of for a number of purposes such as protective devices, peace time munitions and war gases. As a protective device for bank vaults, for instance, a small CO_2 power bottle furnishes a convenient means of atomizing the liquid through a small orifice when set off.

Chlorpicrin is a lachrymatory war gas that has been adapted to peace time use such as fumigation, soil treatment and protective devices.

Its unit toxicity in gas form under practical conditions is probably the highest of all present-day fumigants. It has also remarkable penetration and definite germicidal and fungicidal properties.

Its warning characteristic—expulsive well below concentrations generally considered dangerous—makes it a safer fumigant to all concerned. Improved application methods have tended to remove the early objections that the tear-gas effect limited it commercially because of lingering on products and spaces fumigated.

It has no fire or explosion hazard, nor any effect on textiles, furs or colors.

Chlorpicrin is well established as a rodent and insect fumigant, but its possibilities in soil treatment, and as a germicide and fungicide, are still in the development stage.

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How Detergent Solutions Work

It is possible to distinguish between at least 5 different, but related, processes which possibly occur when a wetting (or detergent or emulsifying) agent is dissolved in water and brought into contact with greasy matter. These are: (*a*) Lowering of the surface tension of the water; (*b*) wetting of a solid surface; (*c*) penetration of the aqueous solution into capillary spaces, such as those in a heap of coal dust or a sized or greasy textile fibre; (*d*) dispersion or emulsification of grease or other hydrophobic dirt in the water; (*e*) detergent action.

Most wetting agents in use contain some hydrocarbon in the molecule, and one or more water-soluble groups, for example, the alkyl sulfates R.O.S.O.$_3$Na, or the alkylated and sulfonated naphthalene derivatives. Some substance of this general constitution does not, however, aid in the wetting of all surfaces, especially those which are fairly easily wetting. A very interesting exception is in the case of the long chain substituted ammonium salts, such as cetyl pyridinium chloride and glass. Clean glass is perfectly wetted by water, but it is only poorly wetted by dilute solutions of these substances which give a clean glass surface quite a greasy appearance. This behavior is probably due to the substances mentioned having positively charged ions at one end of the hydrocarbon chains, and these ions are strongly attracted by the glass which usually assumes a negative charge. Thus the glass, normally a strongly hydrophilic or water-attracting surface, is changed into one largely covered with hydrocarbon, and so its ease of wetting is diminished.

Emulsification or dispersion of the dirt in the water is not by any means fully understood as yet, but one of the predominating factors (perhaps the only factor involving simple energy considerations) is that the interfacial tension between the dirt and the water should be diminished.

There is some little experimental evidence that a low surface tension of the aqueous detergent solution against air, or a low interfacial tension against oil, are not the sole, or the predominating, factors in producing a good detergent. Many substances lower surface tension considerably, but have no detergent action worth mentioning; an example is soap and alkyl sodium sulfates.

Measurements (Robinson and Selby) of the interfacial tension between various detergent solutions and oils have shown several points. Sodium cetyl sulfate lowers interfacial tension very little more than sodium cetane sulfonate, but washing tests show that generally the cetyl sulfates are much better detergents than the cetane sulfonates.

The importance of other factors in detergent action has been shown conclusively by the fact that different detergents differ very much in their order of efficiency when used for washing cotton and when used for wool. For wool, some 10 different detergents give a 10- or 20-fold range of efficiencies, measured by the concentrations required to clean a given standard sample of wool dirtied artificially with lanolin black. The same detergents are much more nearly equally efficient when tried on cotton. Dr. N. K. Adam, British *Chemical Trade Journal*, Jan. 1, '37, p13.

Clothes Moths Condemned

By Benjamin Levitt, F.A.I.C.

THE ravages due to moths annually cost millions of dollars in ruined garments, furs, rugs and furniture. The control, therefore, is an economic necessity.

Clothes moths are yellowish to buff colored insects, with a wing spread of about one-half inch. The moth has imperfectly formed moth parts and does not do the actual harm to the cloth, but the larvae or worms which hatch from its eggs, are the real offenders.

The eggs hatch in four to eight days in summer, while in cold weather, this may take from two to three weeks. The larva matures in about three months, during which time it eats voraciously. Upon reaching maturity, it transforms into the pupal or chrysalis stage, by spinning a cocoon, such as the silk worm. From this, the adult moth emerges in one to six weeks. There is some consolation in the fact that the moth lives only ten days, but most of this time is occupied in laying eggs.

Species of Moths

There are two very common species; namely, the case making clothes moth (*Tinea pellionella L.*) and the webbing clothes moth (*Tineola biselliella Hummel*). The tapestry moth (*Trichophaga tapetzella L.*) is less often found.

The case making moth is so-called because its larva spins a portable case about itself, consisting partly of its own spun silk and partly of the goods which form its food. The larva of the webbing moth spins a silky cocoon about itself, from which it later emerges as an adult moth.

The tapestry moth is slightly larger than the two preceding species and has a wing spread of about three-quarters of an inch. Its habitat consists of horse blankets, tapestries, furs, rugs, and felting. It burrows through the infested material and also eats it, causing damage both ways.

The clothes moth feeds on wool, fur, hair, feathers, and dried animal matter, including skins. It is a relief to know that the mortality rate in moths feeding upon dyed cloth is somewhat greater than in those which feed on raw wool, bristles, fur, etc. In this connection, M. G. Minaeff has found the moth repellent properties of dyes in decreasing order as follows: Methyl Violet crystals and R, Victoria Blue, Fuchsine, Sapranine Y, Indigo, Brilliant Green crystals, Crysoidine Y, Congo Red R, Methylene Blue Ex, Con. and Auramine O.

Methods of Control

Moth control in households is generally limited to cleaning, brushing, sunning, after which the clothes may be stored in tightly wrapped packages containing naphthalene, paradichlorobenzene, or the fabric may be sprayed with pyrethrum extract or solutions of sodium silicofluoride. These methods are more or less haphazard. To ensure a complete kill of all the larvae, the goods should actually be immersed in a mothproofing solution.

Methods for control used in factories and industrial establishments are cold storage, hydrocyanic acid gas fumigation (this must be done by experts, as it is extremely poisonous and dangerous). Fumigation with sulfur fumes, carbon bisulfide or a mixture of one part carbon tetrachloride and three parts ethylene dichloride are also good. The latter has the advantage in being non-inflammable.

The Konate Treatment

Dry heat kills larvae as does hot water, soap solution and dry cleaning. However, after these treatments the fabric may again become infested.

Farmer's Bulletin No. 1353 of the Dept. of Agriculture recommends the following:

Naphthalene at the rate of one pound to each six cubic feet of space. Paradichlorobenzene, in tight closets or chests, one pound to six cubic feet. Gum camphor, one-half to one pound to each five cubic feet, in tight containers. Fresh pyrethrum powder well dusted, in tight containers.

Cold storage: cooling to 18° F. for several days, warming to 50° F., again quickly chilling to the former temperature, and repeating the cycle; lastly, continued refrigeration at 40° F. kills all moth life and protects.

Fumigation with carbon tetrachloride and ethylenedichloride, using 14 pounds to 1000 cubic feet at 70° F., gives good results.

The same bulletin considers the following worthless: Tobacco extracts, lavender flowers, cayenne pepper, powdered sulfur, quassia chips, borax, formaldehyde sprayed 1-10, and many other so-called remedies.

Ever since 1910, when the first moth-proofing patent was taken out, the public has become more and more moth-proof conscious, and since that time many moth-proofing patents have been issued for treating fabric during and after manufacture. In days to come moth-proofed fabrics will be the rule and not the exception.

The following patents indicate the great variety of chemicals used for control and actual moth-proofing:

U. S. 1,615,843, by L. E. Jackson and H. E. Wassell, describes the use of cinchona alkaloid. These are the inventors of the preparation known as Konate, a composition of quinidine with oleic acid dissolved in a naphtha which may be used together with the solvent during dry cleaning. The clothes can be returned to the owner in a moth-proofed condition.

U. S. 1,634,790, by Minaeff and A. P. Sachs, describes the use of sodium fluosilicate and other soluble fluosilicates, or sodium fluoride, sodium sulfate, sodium benzenesulfonate, and sodium naphthalene sulfonate.

The same patentees also use sodium fluosilicate, sodium sulfate and alum, and/or a solution containing less than 0.1 per

cent. oxalic acid. Also a solution containing sodium oleate 0.1, gelatin .005, and sodium fluoride 1 per cent.; citric acid .004 may also be used. Turkey red oil or sulfonated fatty acids are used for wetting out. The previous patent is probably the basis of Larvex.

Brit. 274,425 describes a treatment with 1-hydroxy-4-chloro-2-benzoic acid, or sulfurized derivatives of this.

Can. 280,549. The material is treated with o-hydroxy-3-carboxylic acid or derivative in which the p. position to the hydroxyl group is occupied by a halogen or sulfur.

U. S. 1,682,975. A double salt of fluorine is fixed on the material, *e. g.*, by the use of various fluorides such as those of hydrogen, zinc, sodium, aluminum, tin, or manganese, or complex fluorine compounds and sulfates.

U. S. 1,688,717. Fabrics are treated with aqueous solutions of casein and then with solutions of rare metal compounds such as those of cerium, thorium or lanthalum.

Fr. 636,424. A solution is used containing 4 grains of sodium fluosilicate per liter, with wetting agents such as isopropyl-naphthalenesulfonate or partially hydrogenated aromatic sulfonic acids.

Ger. 459,256, for mothproofing furs. A dry powder containing 5% chlorocresotic acid is used in a revolving drum with the goods. After removing excess powder, the fur is said to be moth-proof.

Brit. 295,742. The goods are treated with tripotassium difluorodisulfate, monopotassium monofluorophosphate and the addition product of the sodium salt of p. toluenesulfonic acid and hydrogen fluoride or potassium bifluoride and organic or inorganic salts or acids.

Brit. 301,421. Fabrics are treated with solutions containing thiourea, phenylthiourea, and other derivatives and compounds of same.

Brit. 160,039. In this, the goods are impregnated with a soluble salt of alginic acid or hot bath of tannin and then treated with a solution of antimony salt for half hour. This is not widely used.

Brit. 313,043. Compounds are employed containing alkyl derivatives of mono or polysulfonates or sulfonic acid. Salts of chromium, aluminum, zinc or titanium may be added. These may be used with water or hydrocarbon dry cleaning fluids or alcohol or acetone.

A. E. Back and R. T. Cotton, *J. Econ. Entomology*, V. 23, p. 1014, state that one to two per cent. rotenone from derris root, dissolved in acetone, may be used to impregnate woolen goods. As little as 0.05 per cent. solution of rotenone gave excellent results.

U. S. 1,739,840 describes a method used for protection against molds, bacteria, moths, etc., consisting of fatty acid salts of thallium, yttrium or titanium and like compounds.

U. S. 1,977,412 includes a hydroxy-substituted diphenyl with a chlorine group, dissolved in a very volatile petroleum hydrocarbon, together with crude scale paraffin wax and stearic acid anilide to provide an effective bond on the fabric, and also to prevent the active ingredient from dusting off the fabric to which it is applied.

U. S. 2,015,533 is a composition comprising an anilide of brucine and its salts.

A. P. Sachs, *J. Tech. Assn. Fur. Ind.*, V. 1, pp. 103-10, in an article concerning the moth-proofing of fur, states that the best method for using Larvex is in the last wet process. It exhausts well and does not affect the shade. The fluosilicate used has a pH 3.2, is resistant to dry cleaning and cold water, but not hot water nor to alkalis.

Burgess and Poole, *J. Tex. Inst.*, V. 22, pp. 141-57 (1931), state that vegetable fibers and silk are not attacked by either the case making or the webbing clothes moths and that partially processed sheep wools containing vegetable oils are not favored by clothes moths. They also found that fatty acids in concentrations to 5.2 per cent on weight of wool do not produce complete immunity. Worsted cloth impregnated with Larvex and Eulans are moth-proofed. Infected wool stored in closed atmosphere containing paradichlorobenzene is effectively protected.

The writer believes that the test of the perfect moth-proofing agent is one which repels the adult moth, so that the insect actually shuns the treated fabric and so will not deposit its eggs thereon. The next best is moth-proofing that either kills the germ in the egg, so that it will not hatch, or if it should hatch, that the first morsel taken by the larva proves fatal.

Furthermore, the perfect moth-proofing agent must be resistant to friction, dry cleaning and a moderate amount of moisture such as rain, and in certain cases it must be wash-proof. Whether any of the above patents will satisfy such stringent requirements as we have outlined is hard to say.

It is to be noted that considerable progress has been made. In conclusion, may we suggest that whatever chemicals are used, complete immersion of the fabric is necessary for the best and most permanent results.

Dust-Laying Agents

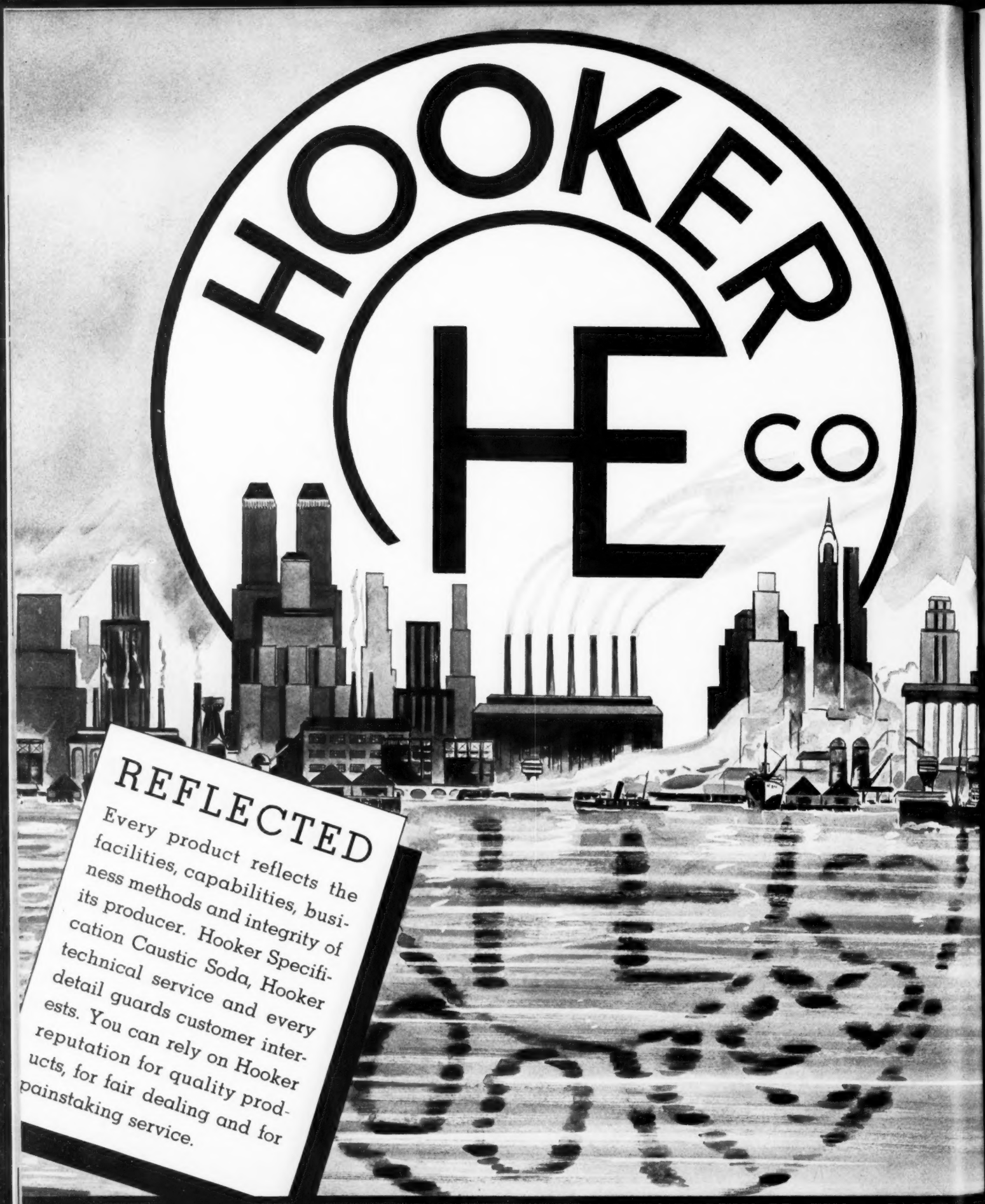
Wetting agents have shown promise of being very valuable for wetting and laying dust. Thus Tideswell and Wheeler (*Trans. Inst. Min. Eng.*, 1934) report the employment of a 1% solution of a wetting agent instead of water in mines for laying the highly explosive coal dust. Again, Hay and Tideswell in a recent paper in the same publication describe the application of a wetting agent to lay dust on roads. The non-sensitivity of a compound like Perminal to lime is taken full advantage of because this substance is used in conjunction with calcium chloride which is a good, cheap binder for dust on roads.

The wetting agent sodium benzyl naphthalene has been claimed by the I. G. in connection with the washing of blast furnace gases (Brit. Pat. 293,003).

Fire-fighting equipment would also appear to offer a very useful scope for wetting agents. Many textile materials show a very strong inclination to resist a stream of water, but if the fireman's jet carries water of low surface tension, of high wetting power, it must obviously be more effective in saturating fabrics and thus rendering them safer from flames. Alkylated aromatic sulfonic acid compounds such as mentioned above, are added to foam fire extinguisher materials in Brit. Pat. 302,172 to the I. G. French Pat. 788,401 employs wetting agents like sodium lauryl sulfonate or Igepon in connection with a fire extinguisher containing sodium bicarbonate and acids. In Brit. Pat. 319,083 the extinguishing fluid is water containing 0.1 to 0.2% of sodium naphthalene sulfonate with an alkyl substitution group. *The Chemical Age*, Nov. 14, '36, p418.

Nickel for Copper Precipitation

The use of nickel for the precipitation of copper from solutions at temperatures above 100° C. and under pressures greater than atmospheric is claimed in English Patent 458,959 of 1936 that has just been granted to the Dr. Kurt Albert G.m.b.H. Chemische Fabriken of Neuss, Germany. Specification states that the deposition of the copper from solutions containing copper and nickel by nickel is known per se. In an example of the pressure process given in the specification a solution containing copper is placed together with a quantity of nickel alloy scrap, in an autoclave, which is a double-walled vessel. Superheated steam at a pressure of, for example, 8—10 atm. is supplied in the outer steam jacket. After closing the autoclave the steam is turned on and the temperature raised to 160°—180° C. Quantity of added nickel alloy scrap must be so chosen that it corresponds to the quantity of copper present in the solution. In a few hours, all the copper is precipitated from the solution and the solution is free from copper. Instead of the previous content of copper, it now contains a corresponding quantity of nickel. British, *The Chemical Trade Journal*, Feb. 12, '37, p142.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Household Specialties

California Exterminators Elect Officers

The Third Annual Convention of the Exterminators and Fumigators Association of California, reflected the consistent growth and interest in pest control operations as over 140 from all parts of the state of California met for two days at San Jose, on February 12-13th Many traveled over 500 miles to attend the convention and felt well repaid for making the trip.

The principal addresses were delivered by Dr. Carl D. Duncan, head of the Dept. of Entomology of San Jose State Junior College; Prof. William B. Herms, entomologist, University of California at Berkeley; C. Emlen Scott, extension specialist in plant pathology, University of California, at Berkeley; Dr. R. W. Doane, Stanford University, Palo Alto, and Dr. Edwin C. VanDyke, Division of Entomology of University of California, at Berkeley.

Legislation was a subject that was paramount in the thoughts of many attending the convention. Innovations this year at the convention included clinics and exhibits.

New Officers and Directors of California Pest Control Association are:—President, George Rader, 1219 Oxford st., Berkeley; 1st vice-president, Wallace Tanner, California Termite Control Co, 6063 Sunset blvd., Los Angeles; 2nd vice-president, Ernest G. Mills, Pacific Exterminator Co., 1065 Mission st., San Francisco; and secretary-treasurer, Elmer A. Roberts, Roberts Co., 1105 Capuchino av., Burlingame.

William O. Buettner, secretary of the National Association of Exterminators & Fumigators, attended the California State Convention as a guest of the Association.

New Jersey Exterminators Form an Association

In an effort to better conditions in Newark, N. J., and in view of impending legislation problems, an organization meeting was held on February 16th by a number of local exterminators and fumigators. Name of this group will be Professional Exterminators of New Jersey.

While there is impending legislation to be enacted in Newark, N. J., the more important subject is that of a proposal known as Assembly Bill 174 before the New Jersey legislature, which would prohibit entirely the use of hydrocyanic acid gas for fumigations. Hearings are to be held on this matter, and assurances have been given by the National Association of Exterminators and Fumigators that they will appear at the hearing to protest and file necessary briefs.

Officers elected of the newly organized Association are:—President, Albert J. Arndt, Arnolene Exterminating; vice-president, E. W. Guttenberger, Guarantee Exterminating; treasurer, Herbert Ulrich, Acme Exterminating.

Month's Federal Trade Commission Rulings

Having entered into stipulations with Federal Trade Commission to discontinue unfair methods of competition, three companies located in Portland, Ore., Pittsburgh and Baltimore, will stop the use of false and misleading advertising in connection with the sale of washing fluids.

Charles Beahm, trading as Laborlite Manufacturing Co., 436 S. E. 6th Ave., Portland, Ore., agreed to cease representing that his trisodium phosphate washing preparation, designated "Laborlite," will sterilize or destroy all germs and will destroy all odors, and that it contains no harmful ingredients and is composed of harmless minerals.

Moonshine Chemical Co., Inc., Pittsburgh, selling Moon-Shine Washing Fluid, signed a stipulation to discontinue advertising that the product destroys odors and kills germs, unless it is clearly indicated in connection with such representations that the product will not destroy all odors and will not kill all germs, including their spores; that it bleaches, removes stains and mildew, deodorizes, disinfects, and kills germs in one operation, and that it has a hundred helpful household uses.

D. H. Koumjian, trading as Del-Tox Chemical Co., 2100 Washington Boulevard, Baltimore, agreed to stop representations that the product he sells under the name "Del-Tox" disinfects as it cleans, sterilizes or kills all germs, and may be used for antiseptic deodorant baths.

Under an order entered by the Commission, Cushing Refining & Gasoline Co., Cushing, Okla., is prohibited from unfairly disparaging Ethyl gasoline, and from falsely representing that all of the gasoline it manufactures and sells is produced by a new process and is superior to the product containing tetraethyl lead, also known as "Ethyl."

Three companies, Superkleen Co., N. Y. City, The Mystic Foam Corp., Cleveland, and Leev-No-Ring Chemical, N. Y. City, have agreed to stop using phrases of the "Leave No Ring" type in the marketing of cleaning fluids.

Mallinckrodt's New Moth Killer Prices

New price schedules on Mallinckrodt Moth Killer give the pharmacist an increased profit this year. The gross on every sale runs from 34% to 40%. Purchased in half dozen lots the one-pound size cans cost the pharmacist $4.20 per dozen, or 35c per can. The profit is 20c per can when sold at the suggested retail price of 55c. On the special "Shipping Case" price, where two dozen of the pound sizes are purchased, the cost-to-druggist is 30c less on the dozen.

In answer to demands, Mallinckrodt now supplies Moth Killer in a new one-quarter-pound can, cost to druggist, $1.90 a dozen. Retailing at 23c per can, each sale yields a profit of 7c. There is also a "Shipping Case" price on this size which gives the pharmacist an even greater gross.

Industrial Specialties

National Oil Products' Personnel Changes

Charles P. Gulick, president, National Oil Products, reports an important reorganization of the industrial sales department and several changes in the officers of the company. The following officers were elected by the board of directors:—President, Mr. Gulick (re-elected); vice-presidents, John H. Barton and Perc S. Brown (re-elected); treasurer, Ralph Wechsler (re-elected); vice-president in charge of industrial sales and Admiracion Laboratories, Inc., a subsidiary, G. Daniel Davis, formerly secretary; secretary, Albert A. Vetter, formerly assistant secretary and assistant treasurer. Mr. Gulick also announced the appointment of Thomas A. Printon, formerly assistant general sales manager, as general sales manager of industrial activities.

The new setup in the industrial sales divisions are as follows:—Textile dept., Mr. Printon, manager; textile specialties division, C. J. Kenlan, assistant manager; textile rayon division, Dr. E. A. Robinson, assistant manager; paper division, G. R. Zust, assistant manager; specialties division, G. H. Small, assistant manager.

Admiracion dept., Stanley I. Clark, manager; professional division of Admiracion, George Leithner, manager.

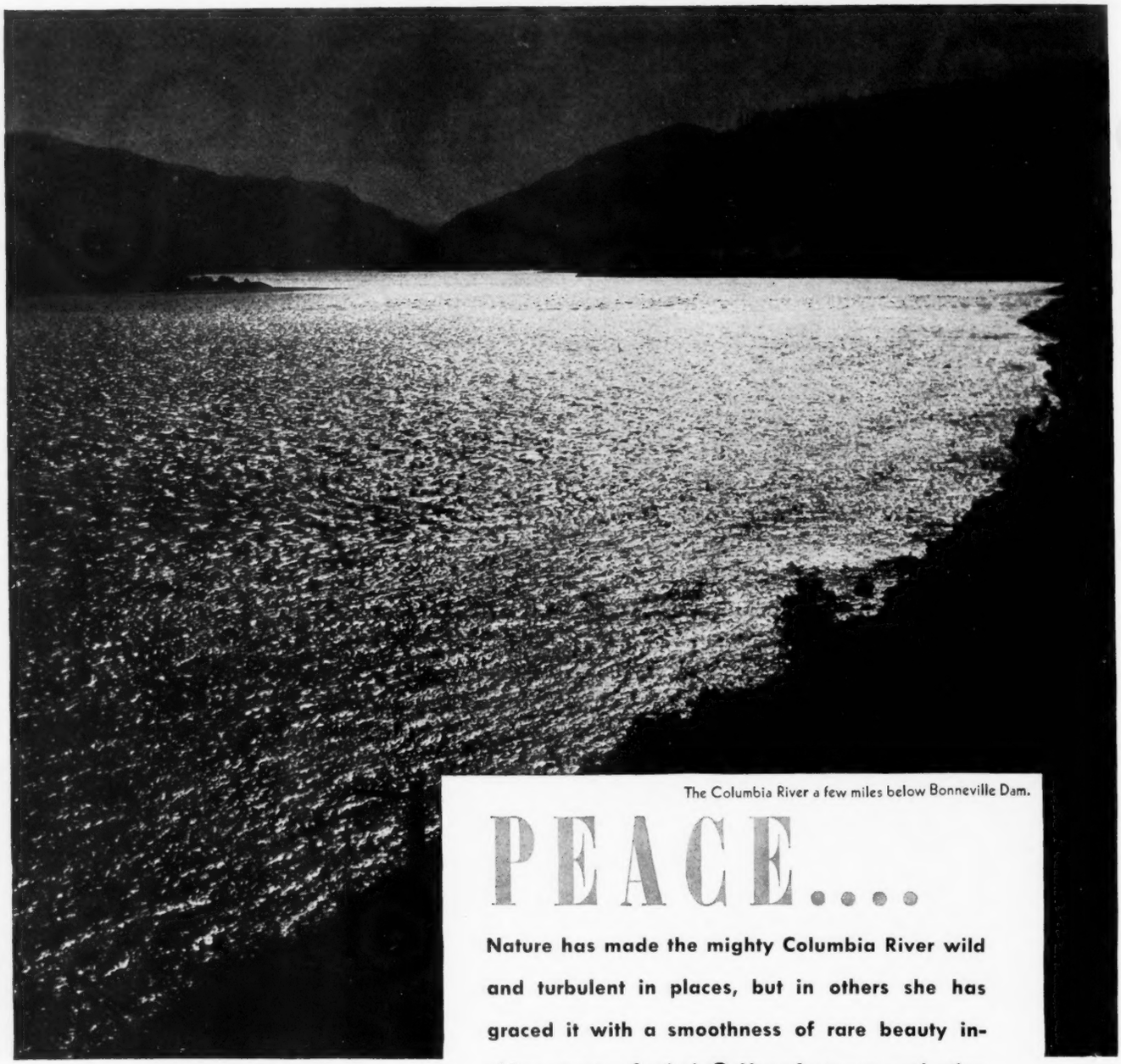
Metasap division, metallic soaps, O. E. Lohrke, manager; tanning division, B. A. Schiller, manager.

Logan Grupelli will manage industrial sales promotion.

Others in New Positions

William Oseasohn is in charge of a new Impregnole sales division which is to be a part of the new sales office of the Warwick Chemical. New office will be located at 580 5th ave., N. Y. City.

COLUMBIA



The Columbia River a few miles below Bonneville Dam.

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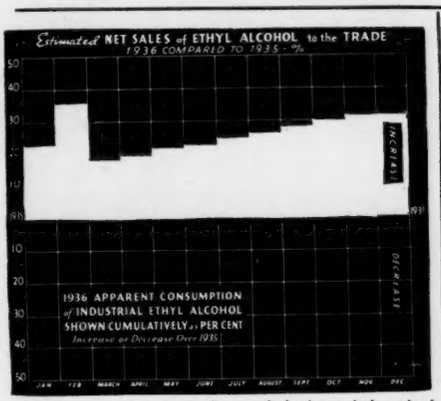
SOLVENT NEWS

MARCH ★ A Monthly Series of Articles for Chemists and Executives of the Solvent-Consuming Industries ★ 1937


Estimated NET SALES of ETHYL ALCOHOL to the TRADE
1936 COMPARED TO 1935 - %
INCREASE
DECREASE
1936 APPARENT CONSUMPTION
of INDUSTRIAL ETHYL ALCOHOL
SHOWN CUMULATIVELY - PER CENT
Increase or Decrease Over 1935

Apparent consumption of industrial ethyl alcohol from Jan. 1 to Dec. 31, 1936, was 81,386,000 wine gallons. This is 33.5 per cent greater than during the same period in 1935 when 60,951,000 wine gallons were consumed.

CLARIFY GASOLINE WITH 188 PROOF C. D. ALCOHOL

To eliminate turbidity in gasoline, a Midwestern refinery adds one part of U. S. I. completely denatured alcohol, 188 proof, to 30 or 40 thousand parts of gasoline. Before they began using alcohol for clarification, this company noted that the gasoline turned to a milky-white color when exposed to light for four or five minutes. They report that when this small percentage of denatured alcohol is added, the gasoline does not become turbid until exposed to light for four or five hours.

CELLULOSE DERIVATIVES IN NEW CIGARETTE FILTER

Viscose, cellulose acetate or other cellulose derivatives may be used as a porous, tubular filling for cigarettes, cigars or tobacco pipes according to the process outlined in a recent patent.

Described is a method for extruding a solution of cellulose ester through a suitable orifice, blowing this with multiple jets of air to open up longitudinal cavities, and then coagulating. Where viscose is used, it is stated that coagulation may be effected by immersion in baths of aqueous solutions of sulphuric acid and sodium sulphate.

Materials similar to finely divided cotton or wood pulp, inert fillers (e.g., chalk, kieselguhr, etc.) and plasticizers may be added to the composition, the patentees state.

PROCESS PROTECTS STEEL

Corrosion-proofing of structural steel by a special three-stage process—sold as a unit—is claimed by certain of the companies who are marketing this process. A rust-inhibiting solution described as consisting of solvents and dispersing agents, phosphoric acid and a chromium compound is applied to wire-brushed surfaces as the first step. Dissolution of grease and rust, and formation of a passive iron-chromium-phosphate deposit are said to result. This foundation coat, state the companies, is ready to receive the priming coat (zinc chromate and iron oxide in a synthetic base) within two hours with no other treatment but simple drying. A finishing coat of synthetic aluminum paint completes the process.

USE BLOWN OIL FOR PYROXYLIN LACQUER

Make Drying Oils Compatible With Lacquer Solvents by Extended Air Blowing

Gauged by the number of inquiries relating to *Solvent News'* description of a recent patent, research on the modification of drying oils for incorporation in nitrocellulose lacquers is a subject of considerable interest.

Another patent recently issued describes such a process. Linseed or similar drying oils are blown at about 55 deg. C. for an extended period—as long as 300 hours in some cases. When a product both soluble in ethyl alcohol and with a viscosity of at least 1 minute on the G and H scale is obtained, the reaction is considered complete.

The patentees dissolve this blown oil in a mixture of organic solvents such as alcohol-xylene which will deter further association reactions. The dissolved oil may then be used with nitrocellulose to form a lacquer for metal, etc., according to the patentees.

STUDY BUTYL XANTHATE AS RUBBER ACCELERATOR

Although butyl alcohol is already used in the manufacture of a number of rubber accelerators, its xanthate was recently under investigation as an accelerator of vulcanization for rubber cements. While butyl xanthate proved to be the most efficient among the accelerators studied, it presented several difficulties such as decomposition in handling.

These may be minimized to some extent by storing in closed jars at a temperature not exceeding 15 deg. C., but it is still apt to decompose, according to the investigators. However, in view of some of its possibilities, further studies are being made.

SMALL PLANES ADD TO LACQUER SALES

Production of Low-Priced Ships at New High Reports Engineer In Interview at Air Show

Among the spectacular exhibits at the National Aviation Show held recently in New York, one development stands out above all others in importance to lacquer manufacturers. Long distance weather forecasting, T.W.A.'s "Overweather Airplane," and the Army and Navy exhibits thrilled the lay visitor but to the manufacturer of aircraft finishes, the almost unheralded rise of private aircraft was intensely significant.

It is these planes, in the low price class of civil aviation, that are supplanting his older outlets and becoming an important market. Fabric-coated ships, selling around $1,000, are actually reaching mass production comparable to the early days of the automobile industry.

Half of Commercial Total

"When a single manufacturer, making only planes in this price class, accounts for almost one third of all the commercial planes built in the U. S., some idea of the growth of this type of aircraft may be gained," Walter C. Jamouneau, chief engineer of the Taylor Aircraft Corp., of Bradford, Pa., said in an exclusive interview with SOLVENT NEWS editors. "In addition, there are numerous other manufacturers producing planes of this type who brought the year's total to about one half of the total output of commercial planes."

The Taylor corporation epitomizes the status of the mushrooming industry. Beginning production in 1931 with an output of four planes, they manufactured 250 during 1935 and, in 1936, more than doubled their capacity, reaching an output of 550 units. In 1937 they expect to turn out 1,000 ships.

All Taylor "Cub" planes are finished with

(*Continued on next page*)

U.S.I.'s CURBAY BINDER when applied to gravel-surfaced road shoulders minimizes the formation of furrows and ruts (at lower left) and does much to provide a compact, long-wearing surface (at upper right) easy to maintain by routine dressing. Both photographs illustrate opposite sides of the same road on the same day. Inserts illustrate common method of application. Long used as a foundry core-binder, Curbay is being tested in a number of other applications such as briquetting, specialty binders, etc.

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MARCH ★ **SOLVENT NEWS** ★ 1937

USE SOLOX TO CLEAN ELECTRICAL EQUIPMENT

Cleaning motor windings and other electrical equipment has been suggested as a new use for Solox. According to "Power" magazine, water must never be used for this purpose. After loose dirt has been blown out by compressed air, the remaining oil and dirt can be loosened with Solox. An ordinary hand fire extinguisher may be used to apply the Solox. A second application of the air blast removes the loosened dirt.

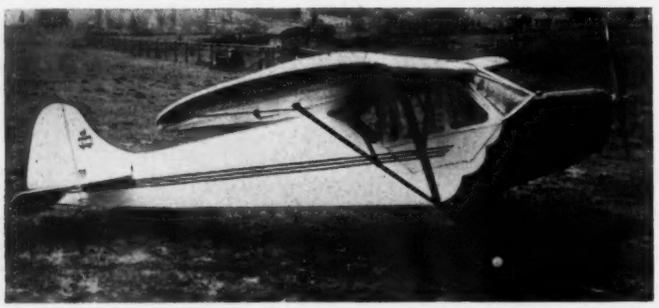
Reasonable care should be practiced when using Solox in a confined space or near a flame. Under ordinary conditions it is a convenient, quick, and inexpensive fluid, evaporates readily and leaves the machine ready for service.

SMALL-PLANE LACQUERS

(*Continued from preceding page*)

nitrocellulose dopes. "Although cellulose acetate dopes are less flammable, a number of drawbacks have restricted their use in this country and they are, for the moment, less in demand than the nitrocellulose finishes," said Mr. Jamouneau.

Typical finishing schedules were outlined by Mr. Jamouneau. After a first coat of clear brushing dope, two coats of aluminum pigmented dope are sprayed on and then sanded.



LACQUER-COVERED LOW-COST PLANE

Typical of small, low-price planes, the Taylor "Cub" (Left) has a fabric covering impregnated with nitrocellulose dopes. A minimum of five coats are required for the finished job.

If the ship is to be finished with aluminum dope two more coats of this are added. When colored finishes are demanded, two coats of the desired color follow the sanding operation. Deluxe finishes call for several additional coats of dope, although this adds to the weight of the plane.

On Taylor "Cub" planes, the surface requiring finishes is distributed approximately as follows: fuselage—250 sq. ft., wings—360 sq. ft., tail—60 sq. ft. Close to 50 gallons of dope is used on each Taylor "Cub" plane and with an output of 1,000 units in sight, almost 50,000 gallons of dope will be consumed in this plant during 1937.

Small amounts of synthetic enamels are used to finish various metal parts such as engine cowling, etc., but decorative features such as insignia and striping are produced with pigmented dope.

Alcohol Is Heat Transfer Fluid in New Radiator

Taking advantage of the good heat-transfer characteristics of alcohol, an "alcohol steam radiator" has been developed. One or two pints of alcohol are placed in a "bottle" which takes the place of the cut-off valve on an ordinary radiator. The alcohol is vaporized and heated by a live steam jacket enclosing the bottle, then flows through the radiator where the alcohol vapor condenses and falls into a small reservoir beneath the radiator. By suitable mechanism, the liquid alcohol is returned to the bottle for reheating.

Advantages claimed for the device are elimination of valves and smoother regulation of radiator temperature; both said to be important in air-conditioning installations.

A folder giving the history and uses of industrial alcohol, a pictograph of its manufacture and a summary of government regulations has been prepared by U. S. I. Write for your copy.

TECHNICAL DEVELOPMENTS

The items in this column are gathered from many varied sources. Further information may be obtained by writing to U.S.I.

U S I

Plastic collapsible tubes formed of alternate layers with and without a plasticizer, have been patented in England. The layers are deposited on a glass or aluminum core to form a thickened closure end to which a block of the plastic is cemented. This block has a slit for the orifice and is reinforced by a metal collar which also opens and closes the orifice by making a quarter turn.

U S I

A laboratory colloid mill recently marketed is said to have the following features: Prevents separation and creaming of certain emulsions, gives smoother and smaller particle size emulsion, requires less emulsifying agent, will take samples as small as four ounces and has an output on a free-flowing emulsion of about 15 gallons an hour. Air is forced out of the grinding chamber through an air release, before starting, to prevent foaming.

U S I

Colors produced on metals by the anodic process may be duplicated by a new series of enamels, according to the manufacturer. The line is reported to be available in a form that may be mixed with clear lacquers to give many transparent colored effects without resorting to chemical processes.

U S I

A new thermosetting adhesive manufactured from starch is finding successful application in laminating corrugated board, according to reports. Being organic and non-alkaline, it does not affect brilliant inks or dull edged tools used in production, the manufacturer states.

U S I

Hard glass may be sealed with a new alloy said to match the coefficient of expansion of glass. It is useful for making vacuum tight seals, is impervious to mercury and may be soldered, brazed or welded to other metals as well as cold formed, according to reports.

U S I

A light-weight solder spray gun now on the market has a self-cleaning nozzle and will spray solder on steel or aluminum without heating the body surface, according to the maker.

U S I

Dynamic and static bending strength of plastics and molded materials can be measured with a new testing machine. Every mechanical test important to users of molded materials can be made from finished articles with the device according to reports.

U S I

An etching agent said to produce a uniformly etched surface on steel and make an effective anchorage for a subsequent protective finish is on the market.

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Refined Amyl Alcohol
Refined Fusel Oil
Secondary Amyl Alcohol
Ethyl Alcohols
Specially Denatured—All Formulas
Completely Denatured—All Formulas
Anhydrous-Denatured
Absolute—Pure
C.P. 96%—Pure and Denatured
Solox—The General Solvent
Super Pyro—The Rustproof Anti-freeze
Pure (190 Proof)—Tax Paid, Tax Free

ALCOHOLS
Butyl Alcohols
Normal and Secondary
Methyl Alcohol

ANSOLS
Ansol M
Ansol PR

ETHERS
Ethyl Ether
U.S.P. and Absolute (A.C.S.)

NITROCELLULOSE SOLUTIONS
Collodions
U.S.P., U.S.P. Flexible and Photo
Cotton Solutions

ESTER SOLVENTS
Acetic Ether
Amyl Acetates
High Test
Commercial
Technical
Secondary
Butyl Acetates
Normal
Secondary
Diatol
Diethyl Carbonate
Estersols
Ethyl Acetates
85-88%, 90%, and U.S.P.
Ethyl Lactate

PLASTICIZERS
Diamyl Phthalate
Dibutyl Phthalate
Diethyl Phthalate
Dimethyl Phthalate

OTHER PRODUCTS
Acetoacetanilid
Ethyl Acetoacetate
Ethyl Chlorcarbonate
Ethyl Oxalate
Ethylene
Sodium Oxalacetate
Acetone
Methyl Acetone
Curbay Binder
Potash By-products

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Robert Pinault, formerly with the Celanese Corp. in Cumberland, Md., and the U. S. Finishing Co., Sterling, Conn., branch, has recently joined the technical staff of Warwick Chemical, West Warwick, R. I.

Daniel J. Saunders is now manager of industrial sales for the Permutit Co., N. Y. City, manufacturers of water conditioning equipment. Mr. Saunders has been with the company for 17 years and has recently been assistant manager of industrial sales.

Lester M. Stroud, well-known in dry cleaning field, is now the New England representative for Riverside Manufacturing, St. Louis.

Murphy Retires from Houghton

Louis Murphy, chairman of the board of E. F. Houghton & Co., Philadelphia, has retired from active management of the company after nearly a half a century of service. He will continue, however, as a director. The '36 sales of the company showed an increase of 25% over '35.

National Oil Products Staff Meetings

Prof. Paul M. Giesy, Newark College of Engineering addressed the monthly staff meeting of National Oil Products on March 1st. At the February dinner meeting, Dr. William G. Nash, of Newark, gave a lecture on "Allergy in Humans."

Fuller D. Baird, Director of the Nutritional Laboratory of National Oil Products, is the chairman of the monthly staff meeting.

J. A. Scheick, optical technician of the Bausch & Lomb, Rochester, N. Y., will speak at the company's meeting on April 5th, on "The Application of Optical Instruments in Industry."

News of the Chemical Specialty Companies

Laurel Chemical Co., 110 S. Dearborn st., Chicago, is a new producer of rust removal products.

Chipman Chemical had a $25,000 fire loss in one of its storage buildings.

Cataract Chemical Co., Buffalo, has started production in its new plant. Company is manufacturing a product used in the treatment of leather goods.

The P. W. Jackson Chemical Co. has leased new quarters at 135 S. Illinois st., Indianapolis.

Huntington Laboratories, Huntington, Ind., has taken over the national distribution of Nu-Mode, a glove finish manufactured by Nu-Mode Materials of Indianapolis. Distribution of this product will be handled under the personal supervision of J. F. Kohl, manager, dry cleaning division of Huntington Laboratories.

Riverside Manufacturing, 4919 Connecticut st., St. Louis, is offering cash prizes for letters from users in dry cleaning plants of "Unisol."

The C. E. Van Winckel Co. has leased a plant at 1310 W. Elizabeth ave., Elizabeth, N. J., to make chemical specialties.

Bloomfield Chemical, 169 Bloomfield ave, Bloomfield, N. J., has just issued a booklet on "Scale-Kem" used for boiler treatment.

United Chemical Processing Co., 202 S. Stinson st., Baltimore, has issued a booklet on caulking oils and putty oils.

Royce Chemical, Carleton Hill, N. J., has purchased a plant at Rock Hill, S. C., to use as a branch of its Charlotte plant.

The B. B. Chemical Co., Middleton, Mass., is planning to build a much larger plant in Cambridge. Company was formerly known as the Boston Blacking & Chemical Co. Company makes specialties for the shoe trade and leather finishes.

Burto Co., 521 5th ave., N. Y. City, is manufacturing a new powder which acts as a coagulant and precipitant of all foreign matters present in dirty solvents. The manufacturer claims its use eliminates the use of caustics and distillation.

Atlantic Research Associates, Inc., specializing in the industrial application of casein and other protein materials and mica, has moved its main offices and laboratories to 763 Washington st., Newtonville, Mass.

Valuable New Booklets Released

The Eaton-Clark Co., 1490 Franklin st., Detroit, has issued catalog 37, containing a list of products for dry cleaners and dyers. The R. R. Street & Co., 561 W. Monroe st., Chicago, has also issued a new catalog.

Advertising, Promotional Plans

Newspaper, magazine and radio advertising of a national scope are being used by P. & G. to launch a new Camay soap contest, which opened March 1st and runs until May 1st. Campaign, stressing the "trailer vacation" aspect, will feature 25 complete trailer outfits, as major prizes. In addition, there will be 300 cash prizes. Twenty-five words on "Why I Like Camay Better Than Any Other Soap" and three Camay wrappers are the requirements.

P. & G., 100 years old next August, is making plans for recognition of the date in various media. Currently, P. & G. is doing an annual business of $150,000,000.

"Prevent ugly 'floor pox'" will be the theme of a spring campaign of S. C. Johnson & Son, Racine, Wis., for its floor wax in 4 women's magazines and gravure sections of 30 large city newspapers.

Swift has launched on its three-a-week network program over 32 stations, through J. Walter Thompson, a contest for Sunbrite cleanser, offering 15 round trips to Hollywood for girls and their mothers. Three hundred dollars in prizes also will be given weekly for 5 weeks, and $100 will be paid every store whose customer wins a Hollywood trip.

The girls are to furnish a word suitable for a secret password for the program's "junior nurse corps." Each password is to be written on a Sunbrite label.

Gold Dust Corp., will introduce animated Shinola shoe polish cans and Shinola white cleaner bottles in a magazine and Sunday newspaper campaign.

Sylvania Industrial, Fredericksburg, Va., has named J. Stirling Getchell, Inc., to place its advertising for Sylphrap brand of cellophane. Present plans call for space in 4 national magazines.

Berry Brothers, Detroit paint manufacturers, are going on the air with a 13-week series of 5 minute transcription programs of music and talking over 45 stations.

Johnson Writes Book on Carnauba

Herbert F. Johnson, Jr, S. C. Johnson & Sons, Racine, has written a book in conjunction with Arthur Daily entitled "Carnauba Expedition." Mr. Johnson has also presented to the Field Museum of Natural History in Chicago a large collection of specimens gathered in the Amazon valley.

Simple Solder Formula

A solder for aluminum plates consists of 60% tin, 25% cadmium, 7.5% silver, and 7.5% aluminum.

Agricultural Specialties

Colloidal Copper Fungicide for Mildew

Trials at the Reale Stazione Enologica at Asti, Italy, are reported as having proved the high value of the following colloidal copper composition as a fungicide against mildew: 200 grams of copper sulfate and 50 grams of citric acid are dissolved in 100 liters of water. Solution is then treated with ferric chloride and finally with soda, until its reaction is neutral, or at the most, only very slightly acid.

Packaging, Handling and Shipping

Production Managers to Meet

The National Association of Production Management formed last July at an informal meeting held in Cincinnati will have its first formal gathering on March 25th at the Pennsylvania, N. Y. City. The Packaging Exposition will be held during this week, permitting production managers to "kill two birds with the one stone." Officers for the coming year will be elected.

According to the plans worked out by the temporary officers and directors elected last summer a restricted membership will be proposed. It is felt that a sufficient number of companies will be interested to maintain a permanent secretary who will obtain and catalog information on package materials, machinery and the solution of packaging problems based on the experience of the various members.

It is the belief of the committee that the free exchange of ideas or reports in handling the many production problems that occur in the use of automatic packaging machinery will result in a benefit to each member company and at the same time not reveal trade secrets or processes that more properly are the private concern of the manufacturing company.

Until such time as the organization is more fully perfected, it is suggested that the annual dues be set at the nominal figure of $25.00 per company.

The following were the temporary officers selected at the July informal meeting: William M. Bristol, Jr., Bristol-Myers Co., president; H. M. Bowman, Stanco, Inc., vice-president; H. F. Brownell, McKesson & Robbins, treasurer.

New Vibrating Barrel Packer

A new electric vibrating barrel packer of low head and high capacity (up to 800 lbs. gross) is announced by the Jeffrey-Traylor Division of Jeffrey Manufacturing, Columbus, Ohio. Standing only 16½ in. high, it requires a shallower pit than other similar units for floor-level operation. As it can be installed water tight by use of a rubber skirt connecting the periphery of the head with the edge of the pit, the packer may be washed down with a hose without fear of wetting the electrical parts.

A sturdy vibrating barrel packer.

The main frame is cylindrical and into it are built 4 powerful stators which drive vertically. Conforming to the main frame, the head is circular, of 30 in. diameter, and provided with either a ring or lugs to fit any container up to its maximum diameter. As the vibrator bars in the stator assembly are tuned for maximum load, the machine will handle any load up to capacity with equal facility. The stators are energized by pulsating direct current, allowing adjustment of the intensity of vibrations to give maximum speed and density of packing for any given material.

National Steel Barrel Offers New Container

National Steel Barrel, 3850 E. 91st st., Cleveland, O., has just introduced a line of 5-gallon pails equipped with the company's easy-to-open, tight-sealing, Quik-Lox Rings (U. S. Pat. 1,706,471; 1,792,281; others pending) that offer many advantages to shippers of solid, semi-solid and liquid materials and to their customers. New pails are easy to fill as the ring permits the head to be removed, exposing the entire interior of the pail to the view of the operator, eliminating exact spotting for filling and reducing the likelihood of spillage to a minimum.

After filling, the gasket-lined heads are replaced and the pails prepared for shipment by simply closing the quick-acting, lever-like ring, thereby lowering the cost of this operation and speeding it up. Provision is made for wire sealing to insure tamper-proof delivery in the event this is desirable. Also, the fully removable heads may be fitted with pull spouts, etc., as needed. A photograph of the pail is shown on the opposite page.

To Determine Weight of Contents of Tanks

A foreign manufacturer of a new weighing apparatus claims that it will weigh the contents of any size tank to an accuracy of plus or minus 0.05 per cent. The apparatus is known as the "Special Balance," and was patented by a Russian engineer, N. Saruchanoff. At present it is manufactured by Hugo Szamatolski, Berlin.

New Rate Guide Published

A new convenience for all shippers and receivers of goods has made its bow to American Industry—the Co-Ordinated Rate Guide, published by Consolidated Guide Corp., 153 N. Michigan ave., Chicago, Ill., and printed by Cuneo Press.

New Latex Adhesive Container

A newly invented paste container and pasting device, marketed by Bateman's 19 British Grove, Chiswick, London W.4., is specially designed to permit the use of latex as adhesive.

Wilbert's Shoe White Wins Packaging Award

Wilbert's No-Rub Shoe White won second award last month in the 4th annual 5- and 10-Cent Packaging Contest sponsored by the *Syndicate Store Merchandiser*.

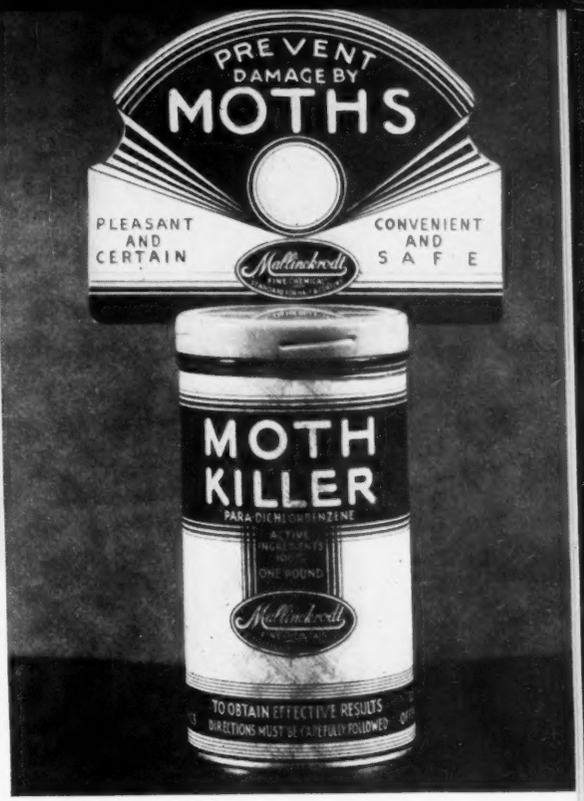
Celluloid Promotes Ward, Packaging Division

E. W. Ward, formerly director of sales of the packaging division of the Celluloid Corp., and with the firm since '21, has been appointed assistant general sales manager, a newly created position.

D. S. Hopping, with the firm a short time, has been chosen to succeed Mr. Ward as director of sales of the packaging division. Mr. Ward was formerly Chicago district manager and Mr. Hopping formerly had his own agency.

Offers a New Packaging Service

The Equitable Paper Bag Co., Inc., 323 Meserole st., Brooklyn, N. Y., has organized a research department for the purpose of analyzing prospective customers' containers in the light of new improvements in the paper bag field. Company experts point out that there are 6 essentials of a modern package:—1. Easy to use; 2. light in weight; 3. small in bulk; 4. strong; 5. attractive in appearance; and 6. low in cost.



Mallinckrodt Chemical is introducing its Moth Killer in a new one-quarter-pound can and supplying the trade with these attractive sales aids. A new shipping container has also been designed.

Chem-X Research Laboratories, 63-65 77th St., Elmhurst, L. I., is introducing a new product for removing soot from oil-burner systems. Product is supplied in one and two-pound cans, and standard fibre-board containers are used which accommodate twelve one-pound cans or six two-pound cans.

New Products—
New Packages

The revolutionary new container offered by National Steel Barrel, of Cleveland, and described in detail on the opposite page.

Let us send you a sample — available in all grades and strengths.

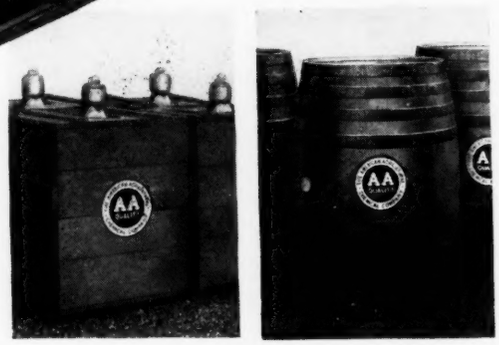
HIGH STRENGTH

PHOSPHORIC ACID

OF UNUSUAL PURITY

We produce "AA Quality" Phosphoric Acid directly from our own Elemental Phosphorus. Strengths: 50, 75, 85, 90 percent, and higher concentrations. Purity guaranteed to 99.99%. Grades: USP, Food-grade, Technical.

Our technical staff will gladly co-operate in determining strength and grade best suited to your requirements. Write for sample; please indicate strength or grade desired.



Adequate stocks of "AA Quality" Phosphoric Acid are maintained at convenient service points, assuring a prompt, dependable source of supply.

The AMERICAN AGRICULTURAL CHEMICAL Co.
50 CHURCH STREET, NEW YORK

New Trade Marks of the Month

336,106
AULT & WIBORG

357,021
ROYAL PURPLE

365,220
TOGSTAD'S
MAGIC

369,568

371,031
HENEX

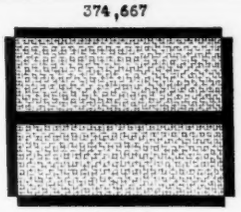
372,209-10
XELSAFIX

372,211-12
MAPROFIX

374,548
AZO
50

376,170
KOTE-RAX

374,667



377,073
PERENNIS

377,784
HY-CLO

378,651
Eryl

378,850
Santo-Resin

378,917

379,524

379,968
SANTO-DRIER

380,345
Duralustre

381,301
KA-LITH-KA
It's Chemically Proportioned
TINTS

381,841
PROTECTO - WAX

381,937

382,008
STA-FLO

382,364

382,396

382,397

Trade Mark Descriptions†

336,106. Ault & Wiborg Carbon & Ribbon Co., Inc., New York City; Mar. 27, '33; mucilage and library paste; use since Mar. '20.

357,021. North Jersey Oil Corp., Bloomfield, N. J.; Oct. 11, '34; gasoline, lubricating oils and greases; use since Sept. 29, '34.

365,220. Vera P. Togstad (C. I. Togstad Co.), Kokomo, Ind.; May 21, '35; washing and cleaning compound; use since Sept. '23.

369,568. Florasynth Labs. Inc., New York City; Sept. 21, '35; food colors, perfume raw materials, perfume oil concentrates, natural floral isolates, and synthetic organic chemicals, particularly aromatics; use since May '16.

371,031. Henex, S. A., Mexico, D. F., Mexico; Oct. 31, '35; removal oxide and rust particularly from inside of boilers and radiators; use since Jan. 1, '33.

372,209. Richards Chemical Works, Jersey City, N. J.; Dec. 3, '35; detergent; use since Dec. '34.

372,210. Richards Chemical Works, Inc., Jersey City, N. J.; Dec. 3, '35; detergent; use since Dec. '34.

372,211. Richards Chemical Works, Inc., Jersey City, N. J.; Dec. 3, '35; detergent; use since Apr. '33.

372,212. Richards Chemical Works, Jersey City, N. J.; Dec. 3, '35; detergent; use since Apr. '33.

374,548. American Zinc Sales Co., St. Louis, Mo.; Feb. 7, '36; zinc oxide for use as paint primer; use since Dec. 30, '35.

376,170. Hanson-Van Winkle-Munning Co., Matawan, N. J.; Mar. 19, '36; preparation for plating racks to protect them from electroplating solutions; use since Nov. 12, '35.

374,667. S. C. Johnson & Son, Inc., Racine, Wis.; Feb. 10, '36; wax for coating and polishing wood, metal and other surfaces, and lacquer; use since Jan. 21, '31 on wax; since July 10, '31 on lacquer.

377,073. Warren Refining & Chemical Co., Cleveland, Ohio; Apr. 10, '36; varnish; use since Oct. 1, '33.

377,784. J. H. Erbrich Products Co., Indianapolis, Ind.; Apr. 29, '36; sodium hypochlorite solution for use as a bleach, germicide, and disinfectant, and for washing and laundering; use since Mar. 15, '36.

378,651. Cilli Ehrlich (J. Ehrlich), Munich, Germany; May 20, '36; insecticides; use since July 10, '12.

378,850. Monsanto Chemical Co., St. Louis, Mo.; May 25, '36; resins and hydrocarbon polymers for coating and molding compositions, etc.; use since Apr. '36.

378,917. Goulard & Olena, Inc., New York City; May 28, '36; moth-deodorant preparation; use since July '25.

379,524. Masao Kawahara (Kawahara Co.), Los Angeles, Calif.; June 10, '36; insecticide; use since Sept. 24, '31.

379,968. Monsanto Chemical Co., St. Louis, Mo.; June 19, '36; materials adapted to promote and accelerate the drying of siccative oils and siccative oil containing compositions; use since June 5, '36.

380,345. Con-Ferro Paint & Varnish Co., St. Louis, Mo.; June 27, '36; paint, enamels, varnishes, and varnish stains; use since Dec. 17, '35.

381,301. Florida Leaky Roof Paint Co., Bradenton, Fla.; Sept. 16, '36; paint paste; use since Sept. 8, '36.

381,841. John M. Cain (Florida Distributing Co.), West Palm Beach, Fla.; Oct. 27, '36; wax polish; use since Sept. 21, '36.

381,937. Hall Hardware Co., Minneapolis, Minn.; Aug. 8, '36; for paints and varnishes; use since Oct. 1, '35.

382,008. A. E. Staley Mfg. Co., Decatur, Ill.; Aug. 10, '36; laundry starch; use since July 30, '36.

382,364. Julius P. Tondat (J. Tondat Co.), Hartford, Conn.; Aug. 19, '36; insecticides; use since June 5, '36.

382,396. Slick-Shine Co., Inc., Newark, N. J.; Aug. 20, '36; beer pipe cleaning compound; use since 1900.

382,397. The Slick-Shine Co., Inc., Newark, N. J.; Aug. 20, '36; metal, silver, and glass polishes; use since 1900.

*Chemical Specialty Patents**

Production insecticide by adding 3 ozs. selenium to 1 gal. calcium polysulfide solution. No. 2,068,742. Chas. B. Gnadinger, Minneapolis, Minn.

Manufacture condensation products applicable as sizes; treating linseed oil and resorcinol with sulfuric acid, finally treating resultant sulfonated mixture with water. No. 2,068,796. Chas. Graenacher and Richard Sallmann to Society of Chemical Industry in Basle, all of Basel, Switzerland.

Method forming diamondiferous abrasive compositions. No. 2,068,848. Jean Hubert Louis de Bats, East Orange, N. J., 10% to Howard W. Dix, Scarsdale, N. Y., and 90% to Metal Carbides Corp., Youngstown, Ohio.

Method photographically producing gelatine reliefs. No. 2,068,879. Leonard T. Troland, deceased, late of Cambridge, Mass., by Cambridge Trust Co., executor, Cambridge, Mass., to Technicolor Motion Picture Corp., Hollywood, Calif.

Method protecting textiles, leather and wood against the action of micro-organisms; by treatment with preservative consisting of monochlorinated mercurized naphthalene. No. 2,068,880. Artturi Ilmari Virtanen, Helsinski, Finland.

Manufacture waxing pad. No. 20,260. Reissue. Wm. W. Weller, Chester, N. J., to Pad-Y-Wax Co., Inc., corporation of N. Y.

Method forming an artificial stone in simulation of a natural stone; using a plastic material in process. No. 2,069,227. Karl Eichstadt, Berlin, Germany, to Oxford Varnish Corp., Detroit, Mich.

Spray gun for applying germicide and insecticide. No. 2,069,352. Thos. W. Brookshire and Samuel McDuffee, Flora, Ill.

Manufacture chewing gum having base made from blend of polymerized vinyl acetate, sulfur, and a plasticizer. No. 2,069,477. Geo. James Manson, Hawkesbury, Ont., Canada.

Method of impregnating wood and other materials with solutions of metallic salts. No. 2,069,491. Bror Olof Hager to Bolidens Gruvaktiebolag, both of Stockholm, Sweden.

Production free flowing sulfur dust, consisting of a finely divided free flowing mixture of sulfur and dicalcium phosphate. No. 2,069,568. Fred. W. Wieder, Berkeley, Calif., to San Francisco Sulphur Co., a corporation of Calif.

Composition for softening textiles. No. 2,069,570. Otto Albrecht to Society of Chemical Industry in Basle, both of Basel, Switzerland.

Composition to be used in forming molded shoe heels and other articles; being mixture of wood flour, dextrine, leather fiber, and cotton waste united by gummy adhesive substance. No. 2,069,585. Arthur W. Marchant, Arlington, Mass., 20% to Theo. C. McElroy, 13⅓% to Jas. J. Hurley, both of Randolph, Mass.; 13⅓% to Jas. H. Dignan, 13⅓% to Cornelius A. Sullivan, both of Braintree, Mass., and 20% to James H. Malone, Wollaston, Mass.

Specialty Patents continued on next page.

* Patents covered in this issue include those appearing in the *U. S. Patent Gazettes*, January 26 to February 16.

† Trade-marks reproduced and described cover those appearing in the *U. S. Patent Gazettes*, January 26 to February 16.

Specialty Patents (Continued)

Preparation oil composition for application to metal surfaces to protect them from corrosion incidental to handling, inspection, or normal exposure; using coating comprising a mineral oil distillate, petrolatum, and pine fatty acids. No. 2,069,626. Theo. G. Roehner, Malverne, N. Y., to Socony-Vacuum Oil Co., Inc., N. Y. City.

Prepared sulfur; mixture consisting of a dry finely divided sulfur and a substantially water insoluble non-hygroscopic, light and fluffy compound of zinc rendering sulfur free flowing. No. 2,069,710. Edmund C. Missbach, Berkeley, Calif., to San Francisco Sulphur Co., corporation of Calif.

Production waterproofing composition; heating mixture of ester gum and a water-soluble soap to a uniform mass, adding a calcium compound, heating mixture, and allowing to cool. No. 2,069,823. Wm. M. Driesen, Clifton, N. J.

Manufacture printing ink, having a basic material derived from rubber by action of an amphoteric metal halide compound, a color, and a volatile oil-free non-oxidizing vehicle. No. 2,069,828. Herbert A. Hauptli, Evanston, Ill., to Sears, Roebuck & Co., Chicago, Ill.

Wall plaster composition, consisting of alkali waste, blast furnace slag, calcined dolomite, calcium sulfate, feldspar, vegetable fibre, potassium sulfate, and aluminum sulfate. No. 2,070,036. Geo. Witty, Long Island City, one-fourth to Siegfried N. Eben; one-fourth to Raymond J. Scanlan, and one-fourth to Jas. M. Mundy, N. Y. City.

Germicidal preparation comprising orthohydroxl-phenylmercuric chloride and an alkylated cresol. No. 2,070,080. Merrill G. Hart to Upjohn Co., both of Kalamazoo, Mich.

Method of making liquid sprays. No. 2,070,167. Carl Iddings, Kew Gardens, N. Y.

Dispersing agent; including a pigment, filler or the like, a terpene alcohol, and a fluid vehicle. No. 2,070,177. Oscar A. Pickett, Kenvil, N. J., to Hercules Powder Co., Wilmington, Del.

Manufacture compounds useful for protection against moths. No. 2,070,350. Jakob Bindler, to J. R. Geigy S.A., both of Basel, Switzerland.

Manufacture isatin compounds useful for protection against moths. Nos. 2,070,351-2-3. Jakob Bindler, to J. R. Geigy S.A., both of Basel, Switzerland.

Composition for rust removing and rust-proofing of metals, comprising phosphoric acid modified with a sulfate of an aliphatic compound which contains an alcoholic radical of no less than 6 carbon atoms. No. 2,070,487. Geo. Lutz, Rocky River, O., to du Pont, Wilmington, Del.

Production antioxidant; a rubber product that has been vulcanized in presence of N-dibutyl alpha naphthylamine. No. 2,070,521. Wm. C. Calvert, Cuyahoga Falls, O., to Wingfoot Corp., Wilmington, Del.

Preparation binding agent for photographic emulsions; coherent insoluble transparent substance consisting of a chromated compound of gelatine and film-forming cold water insoluble, disintegrated starch. No. 2,070,575. Benno Bochskandl, Hamburg, Germany, to International Patents Development Co., Wilmington, Del.

Manufacture insectifuge and insecticide. No. 2,070,603. Lowell B. Kilgore, Washington, D. C.

Manufacture cup grease from mixed calcium and barium soaps 15-30%, partial esterification product of a polyhydroxy alcohol 2-5%, oil 65-83%. No. 2,070,781. Lawrence C. Brunstrum, Chicago, Ill., and Elmer Wade, Hammond, Ind., to Standard Oil Co., Chicago, Ill.

Odorless dry cleaning composition consisting of trichlorethylene which contains in solution a soap composition consisting of an oleic acid, sodium soap, trichlorethylene, and triethylene glycol. No. 2,070,908. Arthur Andrew Levine, Niagara Falls, N. Y., to du Pont, Wilmington, Del.

Metal clad cylinder head gasket having a protective water-sealing coating, comprising mixture of chlorinated naphthalene, paraffin, and carnauba wax. No. 2,070,918. Ruben O. Peterson, Glen Ellyn, Ill., to Victor Mfg. & Gasket Co., Chicago, Ill.

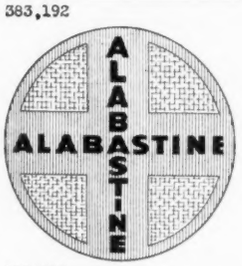
Manufacture friction block; using rosin and plaster of Paris in process. No. 2,070,954. Geo. W. Nickerson, Butte, Mont.

Preparation solid emulsion wax polish; consisting of carnauba wax, water, kerosene, and an emulsifying agent. No. 2,071,027. Edward Newton Dacus and Benjamin Gallsworthy, Glenham, N. Y., to Texas Co., N. Y. City.

Stable fungicidal and bactericidal composition comprising mixtures of acid agents and chlorites of metals of the group of alkali and alkaline earth metals. No. 2,071,091. Maurice C. Taylor, Niagara Falls, N. Y., to Mathieson Alkali Works, Inc., N. Y. City.

Deodorizing composition comprising a briquetted dry mixture of a soluble chloride, an acidifying agent, and a filler of lower solubility. No. 2,071,094. Geo. Paul Vincent, Niagara Falls, N. Y., to Mathieson Alkali Works, Inc., N. Y. City.

383,192



383,459

383,546

383,596

"FLEXI-FLOR"

383,598

WALL-FLEX

383,941

384,539

BENZOFOAM

384,584

BLACK MAGIC

384,092

384,664

ALGLO

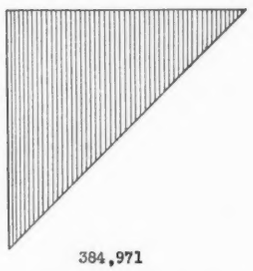
384,843

Celastic

384,925

Chippewa Flakes

384,942



384,971

SANTOFLEX

384,985

UNIPLASTIC

385,081

IROLITE

385,075

MID-PENN

385,184

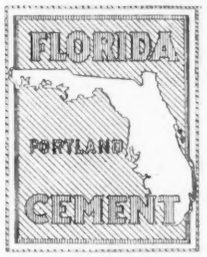
NELIO

385,203

SYLVANIC

385,214

385,222



385,237

385,280

CORAGUM

Descriptions

383,192. Alabastine Co., Grand Rapids, Mich.; Sept. 8, '36; paints of all kinds, varnishes, paint enamels-colors-stains- and sizings; use since Mar. 5, '36.

383,459. Al A. Banks (Lyk-Nu Co.), New York City; Sept. 21, '36; furniture and automobile polish; use since May 1, '30.

383,546. Savogran Co., Boston, Mass.; Sept. 23, '36; cold water soap powder; use since Sept. 21, '36.

383,596. R. C. A. Rubber Co., Akron, O.; Sept. 24, '36; rubber composition for floors or tiling; use since Sept. 21, '34.

383,598. R. C. A. Rubber Co., Akron, Ohio; Sept. 24, '36; rubber tiling for wainscoting or walls; use since Nov. 1, '35.

383,941. Pure Solvent Co., Inc., New York City; Oct. 3, '36; detergent for all purposes; use since Aug. 20, '35.

384,539. David B. Lesser (Benzofoam Products Co.), Chicago, Ill.; Oct. 19, '36; dry cleaning soap; use since Jan. 1, '10.

384,584. Ben Fern Sons, Terrace Park, Ohio; Oct. 20, '36; fertilizers; use since June 1, '36.

384,092. Mariano Fortuny Madrazo, Venice, Italy; Oct. 7, '36; paint colors and paints; use since Apr. '33.

384,664. Metallic Products Co., Inc., Camden, N. J.; Oct. 22, '36; paints and varnishes; use since Oct. 10, '36.

384,843. Celastic Corp., Wilmington, Del., and Arlington, N. J.; Oct. 27, '36; softening compounds for use in shoe industry; use since Dec. 22, '32.

384,925. J. B. Ford Co., Wyandotte, Mich.; Oct. 29, '36; water softening, cleaning compound; use since Oct. '35.

384,942. Wuichet Products, Inc., Dayton, O.; Oct. 29, '36; fertilizers; use since 1887.

384,971. Monsanto Chemical Co., St. Louis, Mo.; Oct. 30, '36; antioxidants for vulcanizing rubber; use since Oct. 17, '36.

384,985. Universal Insulation Co., Chicago, Ill.; Oct. 30, '36; high temperature thermal insulating cement; use since Sept. 28, '36.

385,081. Ironhard Paint & Color Works, Ltd., Los Angeles, Calif.; Oct. 30, '36; paints of all kinds, varnishes, and paint enamels; use since Jan. 1, '33.

385,075. Triplex Oil Refining Co., Inc., Long Island City, N. Y.; Nov. 2, '36; motor lubricating oils; use since Feb. 1, '36.

385,184. Glidden Co., Cleveland, O.; Nov. 5, '36; purified gum, thus, rosin, and limed rosin; use since Aug. 17, '34.

385,203. Sylvanic Co., Inc., New York City; Nov. 5, '36; impregnating and coating yarns, etc., to improve feel, durability and appearance; use since Oct. 20, '36.

385,214. Consolidated Cement Corp., Chicago, Ill.; Nov. 6, '36; Portland cement; use since '25.

385,222. Florida Portland Cement Co., Chicago, Ill.; Nov. 6, '36; Portland cement; use since '27.

385,237. Signal Mountain Portland Cement Co., Chicago, Ill.; Nov. 6, '36; Portland cement; use since '23.

385,280. Corn Products Refining Co., New York City; Nov. 9, '36; combination dry starches used as an adhesive in paste form; use since Sept. 12, '36.

385,321

385,282

385,238

385,322

385,351

385,360

PERMANAMEL

385,382

STEROKLEAN

385,406

385,421

SOLDERPREP

385,440

Lula's HOUSEHOLD Cleaner

385,457

BACTOLINE

385,459

385,499

RACEHARD

385,519

CLORAFIN

385,556

ATOMITOL

385,557

Finegrainol

385,565

385,596

385,614

VIZ
THE MAGIC THAW

385,656

385,677

385,704

SODYESUL

Descriptions

385,321. Whitmore Mfg. Co., Cleveland, O.; Nov. 9, '36; lubricating oil and grease compounds; use since Oct. 20, '36.

385,282. Endowment Foundation, New Brunswick, N. J.; Nov. 9, '36; mosquito larvacide; use since Oct. 22, '36.

385,238. Trinity Portland Cement Co., Chicago, Ill.; Nov. 6, '36; Portland cement; use since 1901.

385,322. Whitmore Mfg. Co., Cleveland, O.; Nov. 9, '36; lubricating oil and grease compounds; use since Oct. 20, '36.

385,351. Hiram T. Gates, Richmond, Va.; Nov. 10, '36; polishing preparations for finished surfaces; use since Nov. 5, '36.

385,360. Mahoning Paint & Oil Co., Youngstown, O.; Nov. 10, '36; paints in all forms, varnish, paint enamel, paint mixing oils, liquid mixing compound for thinning paste paints; use since Oct. 30, '35.

385,382. Adhesives, Inc., Cleveland, O.; Nov. 11, '36; removal rust and scale from radiators, sterilizers, etc.; use since Aug. 19, '36.

385,406. Hygienic Service, Inc., New York City; Nov. 11, '36; antiseptic and germicide for cleansing and sterilizing telephone units; use since Oct. 26, '36.

385,421. Howard R. Neilson (Neilson Chemical Co.), Detroit, Mich.; Nov. 11, '36; removal light scale, rust, grease, etc., from metal surfaces before tinning or soldering; use since June '35.

385,440. Lulu Howard, McAndrews, Ky.; Nov. 12, '36; household cleaner; use since Nov. 10, '36.

385,457. H. Kirk White & Co., Oconomowoc, Wis.; Nov. 12, '36; non-poisonous disinfectant for ice-boxes, milk machinery, etc.; use since Nov. '26.

385,459. H. Kirk White & Co., Oconomowoc, Wis.; Nov. 12, '36; powdered hand cleaner; use since Sept. 15, '36.

385,499. Valentine & Co., New York City; Nov. 13, '36; ready mixed paints; use since Oct. 10, '36.

385,519. Hercules Powder Co., Wilmington, Del.; Nov. 14, '36; plasticizer and softening agent for plastic materials; use since Oct. 27, '36.

385,556. Carus Chemical Co., Inc., LaSalle, Ill.; Nov. 16, '36; photo developers; use since May 1, '36.

385,557. Carus Chemical Co., Inc., LaSalle, Ill.; photo developers; use since June 15, '36.

385,565. Compania Argentina De Quebracho "Marca Formosa" Sociedad Anonima, Buenos Aires, Argentina; Nov. 16, '36; tanning extracts; use since May 16, '35.

385,596. Charles Moss (Mosscony Brand). New York City; Nov. 16, '36; insecticides and disinfectants; use since Oct. 4, '34.

385,614. Viz Corp. of America, Norwalk, Conn.; Nov. 16, '36; defrosting compound for windshields; use since Nov. 6, '36.

385,656. Woolman & Robles, New York City; Nov. 17, '36; restoring lustre to leather; use since Aug. 3, '36.

385,677. Phillips Pure Oil Co., Newkirk, Okla.; Nov. 18, '36; lubricating oils and greases, gasoline, kerosene, naphtha, and motor fuel oil; use since Apr. 4, '23.

385,704. Southern Dyestuff Corp., Charlotte, N. C.; Nov. 18, '36; dyestuffs; use since July 25, '36.

Specialty Patents (Concluded)

Production dry electrolytic condenser; using boric acid, sucrose and triethanolamine in process. No. 2,071,103. Milton Bergstein, N. Y. City, to Micamold Radio Corp., Brooklyn, N. Y.

Production dry electrolytic condenser, using an electrolyte consisting of a triethanol ammonium soap. No. 2,071,104. Milton Bergstein, N. Y. City, to Micamold Radio Corp., Brooklyn, N. Y.

Manufacture fumigating package, using a parasiticide material in process. No. 2,071,171. Henry K. McConnell, Richmond, Va., to Tobacco By-Products & Chemical Corp., Louisville, Ky.

Preparation glass-to-metal seal. No. 2,071,196. Emmett E. Burger and Albert W. Hull to General Electric Co., all of Schenectady, N. Y.

Preparation solder consisting of lead, tin, and copper. No. 2,071,211. Cleveland J. McKinney, Hillsdale, Mich.

Production cement and plaster material; composition comprising Chinawood oil, a metallic drier, water, and powdered cement. No. 2,071,263. John Warne Phillips, one-half to Fingal J. Lindquist, both of Bridgeport, Conn.

Using Premiums

Buckeye Soda will promote "Bikarb" with a chromium bread tray; Colgate-Palmolive-Peet is offering a special dust mop offer with Octagon soap; P. & G. has a new Chipso and a bonbon dish; Colgate is using silver-plated teaspoons as a bait on Kwik-Solv, a quick-dissolving soap; Sapolio has an offer of Beetleware ice tea spoons.

Toxicity of Calcium Arsenate

Recent chemical analyses of a large number of commercial calcium arsenates—widely used insecticides that are less objectionable than lead arsenate from the spray residue standpoint and also less effective against most insect pests—revealed great differences in solubility and other characteristics. The chemists believe that these differences may be responsible for the variation in results obtained in using calcium arsenate. Supplementary tests by entomologists showed that the toxicity of calcium arsenate to insects and its injury to foliage are both decreased by heat treatment, especially in the presence of steam. The reasons for this are still being sought. From a study made by the Bureau of Entomology and Plant Quarantine.

Construction

Socony-Vacuum's new solvent dewaxing plant at Lean, N. Y., is now on continuous stream and is yielding satisfactory runs. Kendall Refining's new propane dewaxing and deresining plant at Bradford, Pa., started operations last month.

T. W. Asbury, manager of Cyanamid & Chemical's Valdosta plant, reports plan for doubling present capacity for the manufacturing of rosin sizes for paper.

Construction that will "practically double" the capacity of Ethyl-Dow Chemical's plant at Kure, Wilmington, N. C., has been announced by Willard Dow. Project will provide employment for 700 to 1,000 workers and will require approximately 6 months to complete.

385,705

SODYEFIDE S-67

385,713

ADSOL

385,721

RED CROWN

385,722

klex

385,735

COALAID

385,798

385,938

385,996

SYNHIBIT

386,065

Calistone

386,100

CUSOL

386,124

REX

386,266

NAILCRETE

386,372

MARATAN

386,401

PENNBROOK

386,463

RE-NUZ-ALL

386,468

WIZARD

386,479

BLUE-FLO

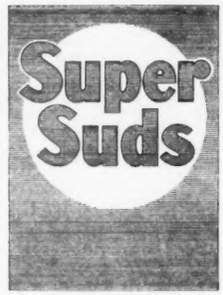
386,494

NUODEX

386,534

NOVEX

386,579



386,686

ROCKTITE

386,714

386,943

SU-veneer

384,752

PETROCIDE

385,952

KORN'S

Descriptions

385,705. Southern Dyestuff Corp., Charlotte, N. C.; Nov. 18, '36; dyestuff; use since Oct. 19, '36.

385,713. H. Kirk White & Co., Oconomowoc, Wis.; Nov. 18, '36; cleaning compound and type cleaner; use since July 26, '36.

385,721. Boyer Chemical Lab. Co., Inc. (Boyer Chemical Works), Chicago, Ill.; Nov. 19, '36; lye; use since Oct. 7, '36.

385,722. Colgate-Palmolive-Peet Co., Jersey City, N. J.; Nov. 19, '36; soap; use since July 16, '20.

385,735. Johnson-March Corp., New York City; Nov. 19, '36; treatment coal to render it dustless and prevent freezing; use since Sept. '34.

385,798. Pacific Coast Borax Co., New York City; Nov. 20, '36; cleanser; use since August '35.

385,938. Nyanza Color & Chemical Co., Inc., New York City; Nov. 24, '36; waterproofing materials for treatment textiles, etc., in finished form; use since Apr. '29.

385,996. Thompson & Co., Oakmont, Pa.; Nov. 25, '36; paints, pigment vehicles, varnishes, undercoaters, paint primers and thinners, rust inhibitors for metallic surfaces; use since Nov. 2, '36.

386,065. Celotex Corp., Chicago, Ill.; Nov. 25, '36; structural heat insulation and acoustical materials; use since Oct. 25, '36.

386,100. Cu-Sol Products Corp., New York City; Nov. 30, '36; colloidal copper; use since Mar. 14, '36.

386,124. Patent Cereals Co., Geneva, N. Y.; Nov. 30, '36; wall paper remover; use since Nov. 18, '36.

386,266. Nailcrete Corp., New York City; Dec. 3, '36; cementitious building material; use since Nov. 27, '15.

386,372. Marathon Paper Mills Co., Rothschild, Wis.; Dec. 5, '36; tanning materials and extracts; use since Aug. 2, '32.

386,401. Brooks Oil Co., Cleveland, O.; Dec. 7, '36; lubricating oil; use since 1926.

386,463. Vel-Vette Labs., Inc., New York City; Dec. 7, '36; removal stains, etc., from rugs, fabrics, walls, etc.; use since Aug. 1, '36.

386,468. Wizard, Inc., Chicago, Ill.; Nov. 30, '36; carpet and shoe cleaner, metal and shoe polish; use since Dec. 10, '14 on metal polish and carpet cleaner; since Aug. 9, '34 on shoe cleaner and polish.

386,479. Carbide & Carbon Chemicals Corp., New York City; Dec. 8, '36; anti-freeze compounds; use since Nov. 10, '36.

386,494. Nuodex Products Co., Inc., Elizabeth, N. J.; Dec. 8, '36; paint, varnish, enamel, and lacquer driers; use since May 13, '32.

386,534. Diversey Corp., Chicago, Ill.; Dec. 9, '36; cleaner for metallic containers; use since Oct. 15, '36.

386,579. Colgate-Palmolive-Peet Co., Jersey City, N. J.; Dec. 10, '36; soap; use since Aug. 26, '35.

386,686. New England Whiting Co., East Boston, Mass.; Dec. 12, '36; paint in dry form; use since Nov. 13, '36.

386,714. American Agricultural Chemical Co., New York City; Dec. 14, '36; fertilizers; use since Sept. 17, '35.

386,943. General Printing Ink Corp., New York City; Dec. 19, '36; varnish; use since Sept. 1, '36.

384,752. Latimer-Goodwin Chemical Co., Grand Junction, Colo.; horticultural sprays; use since July 1, '36.

386,952. Wm. Korn, Inc., New York City; lithographic rubbing and transfer inks, lithographic liquid and stick tusche, autographic ink, music plate, transfer ink; use since 1880.

Chemical Construction (Con.)

Rumors state that Westvaco is considering doubling the present plant capacity at South Charleston. M. G. Geiger, plant manager, admitted to reporters that some outside engineers were at the plant "checking."

Both Westvaco and Carbide are said to be endeavoring to find suitable equipment to abate the cinder and soot nuisance at their respective Charleston plants.

Niacet Chemical has awarded a contract to the Niagara Falls firm of Wright & Kremmers, Inc., for construction of a one-story fireproof addition to its chemical manufacturing plant at Pine av. and 47th st., to cost about $50,000 with equipment.

Construction of Hercules' plant near Parlin, N. J., to make cellulose acetate is under way. An initial capacity of 1,000,000 lbs. annually is planned. The plant to make ethyl cellulose, located near Wilmington, is close to completion.

Work on Jefferson Lake's new plant at Clements Dome, Texas, is progressing satisfactorily despite unfavorable weather conditions.

Chartiers Oil, Pittsburgh, has awarded a contract for the construction of a natural gas purification plant at Wayne, W. Va., to Koppers' Engineering and Construction Division. Plant will employ the new Koppers sodium phenolate process. This will be the third plant to employ this new Koppers patented process for the recovery of hydrogen sulfide from natural gas, coke oven gas and refinery still gases. A description of the process was contained in the Plant Operation Section of the February issue.

Penn Salt will make a $30,000 addition to the Wypenn Oil plant at Tacoma, Wash.; Eastern Tar Products, Baltimore, will erect a distilling plant at South Money Point, near Norfolk, Va., to cost $40,000.

Other construction plans reported last month include a $150,000 addition to Wallace & Tiernan's plant at Belleville, N. J.; a $150,000 plant in Chicago for National Adhesives; and a new fertilizer plant at Harborton, Va., by a newly organized firm, Quinn Menhaden Fisheries, Inc.

Damage estimated around $15,000 was caused by a fire at the Delta Chemical & Iron Co. plant near Wells, Mich., on Jan. 12th.

CHEMICAL

NEWS & MARKETS

James G. Marshall, general superintendent, Niagara Falls and Welland plants of Union Carbide and Electro Metallurgical, is the Schoellkopf medalist for 1937.

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The consistently high quality of our product is winning wide favor in place of the imported material.

Available in CALCINED 98/100% - 99/100% HYDRATED 83/85% and LIQUID 47/48% forms.

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CENSUS SHOWS WIDE EXPANSION

Employment Increased 23.9%; Value of Products Up 40.3% in '35 Over '33 Total—Patman Seeks Curb on Reciprocal Agreements—Plans Laid for 16th Exposition of Chemical Industries—

Manufacturers of chemicals in the U. S. reported substantial increases in employment and production in '35 as compared with '33, according to preliminary figures compiled from the returns of the recent Biennial Census of Manufactures, released recently by Director William L. Austin of the Bureau of the Census, Dept. of Commerce.

Wage earners employed in the chemical industry in '35 numbered 65,876, an increase of 23.9% over 53,190 reported for '33, and their wages, $80,480,665, exceeded the '33 figure by 35.9%. Total value of the products made in the industry in '35 was $668,697,448, a gain of 40.3% as compared with $476,502,663 reported for '33. These totals, however, include large but indeterminate amounts of duplication due to the use of the products of some establishments as materials by others.

This industry, as constituted for Manufactures Census purposes, embraces establishments engaged primarily in the production of chemicals other than those classified as explosives, fertilizers, soap, and wood-distillation products, which are assigned to separate industries.

Summary statistics for '35, '33, and '29 are given in the following table. Detailed production figures for specific classes of chemicals are being issued in separate press releases, 7 of which have already been published. The entire series will cover all chemicals made in the industry.

Summary for the Industry: 1935, 1933, and 1929

(Because they account for a negligible portion of the national output, plants with annual production valued under $5,000 have been excluded since 1919)

	1935	1933	1929	Per cent. of increase or decrease (—) 1933-1935	1929-1935
Number of establishments	570	541	551	5.4	3.4
Wage earners (average for the year)[1]	65,876	53,190	62,199	23.9	5.9
Wages[2]	$80,480,665	$59,228,692	$94,680,013	35.9	—15.0
Cost of materials, containers, fuel, and purchased electric energy[2]	$329,391,117	$221,453,486	$363,576,811	48.7	— 9.4
Products, total value[2]	$668,697,448	$476,502,663	$738,048,386	40.3	— 9.4
Chemicals[3]	624,580,673	427,509,191	671,767,066	(4)	— 7.0
Other products (not normally belonging to the industry)[4]	44,116,775	39,149,284	66,281,320	(4)	—33.4
Chemicals and other products not reported separately (on abridged schedule)[5]	.....	9,844,188	.....	....	.....
Value added by manufacture[6]	$339,306,331	$255,049,177	$374,471,575	33.0	— 0.4

[1] Not including salaried officers and employees. The item for wage earners is an average of the numbers reported for the several months of the year. In calculating it, equal weight must be given to full-time and part-time wage earners (not reported separately by the manufacturers), and for this reason it exceeds the number that would have been required to perform the work done in the industry if all wage earners had been continuously employed throughout the year. The quotient obtained by dividing the amount of wages by the average number of wage earners cannot, therefore, be accepted as representing the average wage received by full-time wage earners. In making comparisons between the figures for 1935 and those for earlier years, the possibility that the proportion of part-time employment varied from year to year should be taken into account.

[2] Profits or losses can not be calculated from the census figures because no data are collected for certain expense items, such as interest, rent, depreciation, taxes, insurance, and advertising.

[3] Detailed production statistics for the several classes of chemicals made in the industry are being issued in the form of separate press releases.

[4] As indeterminate amounts representing the values of chemicals and of other products are included in the 1933 figure for "Chemicals and other products not reported separately" (see footnote 5), the 1933 figures for "Chemicals" and for "Other products" are slightly incomplete and therefore are not strictly comparable with the corresponding figures for 1935. No percentages of increase are, therefore, presented.

[5] An abridged schedule, which did not provide for reporting production in detail, was used in the census for 1933 for canvassing the smaller establishments.

[6] Value of products less cost of materials, containers, fuel, and purchased electric energy.

Proposed Legislation

Congressman Patman has introduced a bill (H. R. 4726) in Congress which is aimed at preventing reciprocal agreements between sellers and buyers. The bill would make it unlawful for any person engaged in commerce to make a sale of commodities on the condition that the seller will in turn purchase any commodities from the buyer, where the effect of the arrangement may be substantially to lessen competition or tend to create a monopoly or to injure competition. The bill would apply to the furnishing of services as well as to the sale of commodities and would be an amendment to the Clayton Act.

He has also introduced in the House a bill (H. R. 4722) intended to prevent manufacturers of products from selling their products at retail in certain cases. For the purposes of the bill, the word "manufacturer" includes a person, partnership, association, or corporation engaged in producing or manufacturing commodities and selling them, in commerce, to wholesalers, jobbers, or retail dealers. Bill declares that it shall be deemed to be an unfair method of competition in commerce, within the meaning of Section 5 of the Federal Trade Commission Act, for a manufacturer to offer for sale and sell at retail to consumers any of the commodities produced or manufactured by such manufacturer, where the effect of such offering for sale and selling such commodities at retail to consumers may be substantially to lessen competition between such manufacturer and his customers. "Customer" is defined in the bill as including only a retail dealer who at any time already is established in the business of offering for sale and selling to consumers commodities produced or manufactured by such "manufacturer" as defined in the bill.

Would Amend Antitrust Act

Senator Tydings and Representative Miller have introduced identical bills (S. 100 and H. R. 1611) in the Senate and the House to amend the Sherman Antitrust Act. Bills would exempt from the prohibitions of the Sherman Act contracts prescribing minimum resale prices for trade-marked or branded goods competitive in character. This exemption would be applicable to commerce in those States only where such contracts are lawful in intrastate commerce under State law. The bills would supplement State fair trade laws already adopted in some 16 or 18 states and pending in many others. Bills would also exempt such contracts from the operation of Section 5 of the F. T. C. Act, which prohibits unfair methods of competition.

Exposition Space In Demand

The 16th Exposition of Chemical Industries will be held at Grand Central Palace, N. Y. City, Dec. 6-11, 1937. Three floors of Grand Central Palace have been reserved and advance leasing to date indicates that the 1937 Exposition will be one of the largest in recent years. Design and preparation of the more extensive exhibits is carried forward during a period of from 8 to 10 months in advance of Exposition week, and companies leasing the smaller exhibition spaces have been anxious to make their contracts well in advance in an effort to secure their particular preference in location, with respect to floors, aisles, corners and entrances.

COAL TAR PRODUCTS
ACIDS
CRESYLIC ACID PHENOL U.S.P. CRESOL
ORTHO CRESOL HIGH BOILING TAR ACIDS
META PARA CRESOL LOW BOILING XYLENOL
CHEMICALS
ACENAPHTHENE ANTHRACENE CARBAZOLE FLUORENE
METHYL NAPHTHALENE NAPHTHALENE PHENANTHRENE
OILS
BRUSHING OIL COAL TAR OIL CREOSOTE OIL LIGHT OIL
NEUTRAL OIL TAR ACID OIL
Reilly
INDUR PLASTICS
INSULATING VARNISH LAMINATING VARNISH
MOLDING POWDER MOLDING RESIN
SPECIAL PRODUCTS
CARBON COKE COAL TAR PITCH TRANSOTE
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Indications at this early date point to an Exposition in which the role of chemical industries in the great reconstruction period now under way will be emphasized through the medium of dynamic displays designed to show the coordination of each phase of chemical manufacture with the many industries to which it is related.

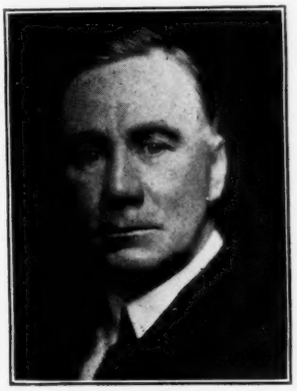
Slogan Competition Announced

A feature of the next Exposition will be a prize competition for a slogan typifying the role of chemical industries in modern life. The slogan will be expected to represent accurately the purposes of the chemical industries and the benefits accruing to mankind from their activities. Details of the slogan contest will be announced at an early date.

The 16th Exposition will be under the direction of the International Exposition Co., who will have charge of all matters pertaining to leasing and exhibit arrangement. Charles F. Roth, who has been similarly responsible for all of the previous expositions, will again be personally in charge.

Attacks Reciprocity Trade Pacts

Francis P. Garvan of the Chemical Foundation, told the Senate Finance Committee on Feb. 15th that "Franklin D. Roosevelt, Jr. is alive because of a development of our domestic dye industry."



FRANCIS P. GARVAN

He brought his arguments "close to home."

Mr. Garvan said young Mr. Roosevelt recovered from a recent streptococcus throat infection because of the use of a chemical which was a "waste product of the dye industry."

He cited the treatment of the President's son as an argument in favor of protecting the domestic chemical industry.

He attacked the reciprocal trade program, which the administration wants extended for 3 years, as threatening to block new industries and scientific research in this country.

To Pass On Oil Tax

The Supreme Court decided on Feb. 15th to entertain an appeal involving the constitutionality of the tax on the processing of coconut oil from the Philippines. Court acted on two appeals brought by Cincinnati Soap and Haskins Bros. & Co. Tax, amounting to 3c a lb., is imposed on the first domestic processing of coconut oil imported from the islands. In similar situations earlier in the present term the court had refused to entertain similar appeals.

Lacks Presidential Benediction

President Roosevelt on Feb. 23rd expressed dissatisfaction with the Copeland Pure Food and Drug Bill as now drawn and indicated that he might oppose its passage.

Asked at his press conference about his attitude, the President said his first impression of the bill was that it weakened the law passed 32 years ago.

Obituaries

¶Laffey, Retired du Pont General Counsel, Dies of a Stroke—Other Deaths Last Month—

John Paul Laffey, 74, retired general counsel and head of the du Pont legal department, who also had served as a director and vice-president of the concern, died at his home in Wilmington on Feb. 8th from a stroke suffered 3 weeks ago. His health had been poor since the death of his wife, Mrs. Marie Soutiere Laffey, more than 5 years ago.

Mr. Laffey, who was known as Judge, had a part in a number of the most important legal steps for du Pont in the last 30 years.

Mr. Laffey was a vice-president of the du Pont Powder Co, predecessor of the E. I. du Pont de Nemours & Co., when the latter was organized in 1915, and he became general counsel and set up the legal department.

Mr. Laffey was a leading figure in the anti-trust litigation in which the du Pont Co. was involved in 1912, and supervised the legal details of the corporate separations which followed.

He also had charge of the litigation which followed the changes in the company when T. Coleman du Pont sold out his interests in it.

During the World War Mr. Laffey handled the complex litigation which grew out of the company's relations with the government. After peace came, he went to Europe to obtain important dye patents and establish the company's relations with foreign chemical interests.

Deaths Reported in February

George Morgan Snow, 78, former New England representative for du Pont, died on Feb. 22nd in Providence, R. I. He resigned as vice-president and a director of the Badische Co. of New York after the U. S. entered the World War and joined the du Pont organization as New England dye sales manager.

Geoffrey James, 45, former assistant professor of chemistry at the University of Pennsylvania, died in Philadelphia on Feb. 17th following an automobile accident on Feb. 10th.

W. G. Griesemer, vice-president and treasurer of the Black Flag Co., Baltimore, and first vice-president of the National Association of Insecticide & Disinfectant Manufacturers, died on Feb. 2nd from an attack of pneumonia.

Alexander K. Roe, 78, general manager and founder, Suffolk Fertilizer, Norfolk, Va., died on Feb. 3rd after a week's illness.

Gustav Knecht, 61, for many years a managing partner of Braun, Knecht & Heiman, San Francisco, died on Feb. 1st.

Pick Chemists' Club Slate

William Callan, Casein Co. of America, has been picked to head the slate of the nominating committee of the Chemists' Club in N. Y. City. Others presented by the committee which was headed by Dr. Maximilian Toch are:—Resident vice-president, A. E. Marshall; non-resident vice-president, E. R. Weidlein; suburban vice-president, R. J. Moore; secretary, Robert T. Baldwin; treasurer, S. J. White; trustees, three-year term, J. A. Rafferty and Thomas Midgley, Jr.; trustee for two years of unexpired term, Harry H. Replogle.

COMING EVENTS

Technical Association of the Pulp and Paper Industry, Feb. 22-25. Waldorf-Astoria, N. Y. City.

American Society for Testing Materials, Regional Meeting, Palmer House, Chicago, Mar. 1-5, '37.

American Ceramic Society, Annual Meeting, Waldorf-Astoria, N. Y. City, week of Mar. 21, '37.

12th Southern Textile Exposition, Textile Hall, Greenville, S. C., Apr. 5-10, '37.

American Institute of Mining & Metallurgical Engineers, Open Hearth Conference, Birmingham, Ala.

American Chemical Society, 93rd Meeting, Chapel Hill, N. C., April 12-15.

International Association for Testing Materials, 2nd International Congress, London, Apr. 19-24, '37. K. Headlam-Morley, 28 Victoria st., London, S. W. 1.

14th Midwest A. C. S. Regional Meeting, Omaha, April 29-May 1.

American Institute of Chemical Engineers, semi-annual meeting, Toronto, Canada, May '37.

American Water Works Association, annual convention, Hotel Statler, Buffalo, N. Y., June 7-11.

14th Colloid Symposium, Minneapolis, Minn., June 10-12.

American Society for Testing Materials, 40th Annual Meeting, Waldorf-Astoria, N. Y. City, June 28- July 2, '37.

"Achema VIII," Plant exhibition, in connection with 50th General Meeting of Verein Deutscher Chemiker, Frankfurt, Germany, Sept., 1937.

American Chemical Society, 94th Meeting, Rochester, N. Y., Sept. 6-10, '37.

Exposition of Chemical Industries, Grand Central Palace, N. Y. City, Dec. 6-11, '37.

LOCAL TO NEW YORK*

April 9th, Joint Meeting 4 societies.
April 23rd, A. I. C.
May 7th, A. C. S. annual meeting.
May 21st, A. I. C. annual meeting, N. Y. Chapter.

* Chemists' Club unless otherwise noted.

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The consumption of Methyl Ethyl Ketone in the lacquer, ink, resin and plastic industries, indicates that its properties have been found to have considerable value. Its advantage as a solvent in the formulation of lacquers is well known and its high solvency and low weight (6.72 lbs. per gallon) are characteristics which give it considerable advantage over other low boiling solvents.

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Butyl Alcohol (Tertiary)
Di Isobutylene
Iso Crotyl Chloride
Iso Propyl Alcohol
Iso Propyl Ether
Mesityl Oxide
Methallyl Alcohol
Methallyl Chloride
Methyl Propyl Ketone
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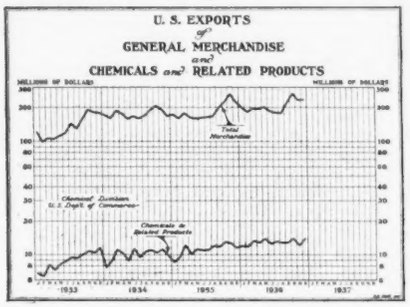
Selling agents for

Shell Chemical Company

Chemical Imports Reached $148,500,000 in 1936

Receipts of Oils Especially Heavy—'37 Foreign Trade Outlook Bright—Exports to Germany in Good Volume—Canadian Chemical Industry Expanding—Other Foreign Developments—

Imports of chemicals, industrial oils, and other raw and semi-manufactured materials required by American chemical and related product manufacturers advanced sharply in '36. Receipts reached $148,500,000 during the year, which com-



Uptrend in chemical exports shown graphically.

pares with $120,000,000 in '35, $96,000,000 in '34, and $70,000,000 in '33. The 24% increase recorded in our imports of these products in 1936, fully 90% of which was destined for industrial consumption, clearly reflects the accelerated industrial activity which obtained throughout the year.

Of the '36 total around 30% (on a value basis) consisted of industrial chemicals; fertilizer materials made up 24%; drying oils, 19%; crude drugs and derivatives 13½% and gums, resins, and waxes, 9½%.

Receipts of industrial oils were especially heavy in 1936 but imports of flaxseed, from which linseed oil is expressed, declined from 17,559,60 to 15,365,000 bus. Compared with 1935 imports of tung oil increased from 125 to 135 million lbs. and perilla from 72 to 118.

Other outstanding gains included fertilizer materials which rose from 1,374,242 to 1,515,700 tons in quantity and from $28,561,000 to $33,394,000 in value; industrial chemicals from $16,145,000 to $20,-960,000; casein from 3,229,700 to 16,-209,000 lbs.; and carnauba wax from 10,420,500 to 12,500,000 lbs.

Declines were recorded in receipts of dyeing and tanning materials, gums and resins, paint materials, industrial explosives, soaps and toilet preparations.

Our Exports Are Expanding

The 1937 foreign trade outlook for chemicals and related products is particularly good. Aside from a few countries, economic conditions throughout the world are improving steadily, individual purchasing power is increasing, the consummation of international trade agreements is smoothing the rough spots in trade channels, and, perhaps, most significant of all are the gratifying trends that have been noted during the year just ended.

Foreign demand for American chemical products during 1936 continued the upward trend that has been noted each year since 1932, preliminary statistics show. The volume of such shipments during the period from 1933 to 1936 has increased approximately 50% with all staple commodities sharing in the gain and a number of relatively new products such as plastics, synthetic resins, heating and refrigerating gases, and other gases, apparently firmly establishing themselves in the trade.

Declines were recorded in imports of coal-tar dyes, colors, stains, etc., (receipts of which dropped from 3,952,670 to 3,070,000 lbs.), pyrethrum flowers, paint materials, and industrial explosives.

Notwithstanding the many handicaps that have tended to restrict German-American trade in recent years, exports of American chemical products to that country were well maintained in '36 with most of the leading items entering into the trade recording substantial gains in volume. Most outstanding gains were recorded in Germany's imports of American turpentine, rosin, tobacco extract, phosphate rock, crude borax, and benzol.

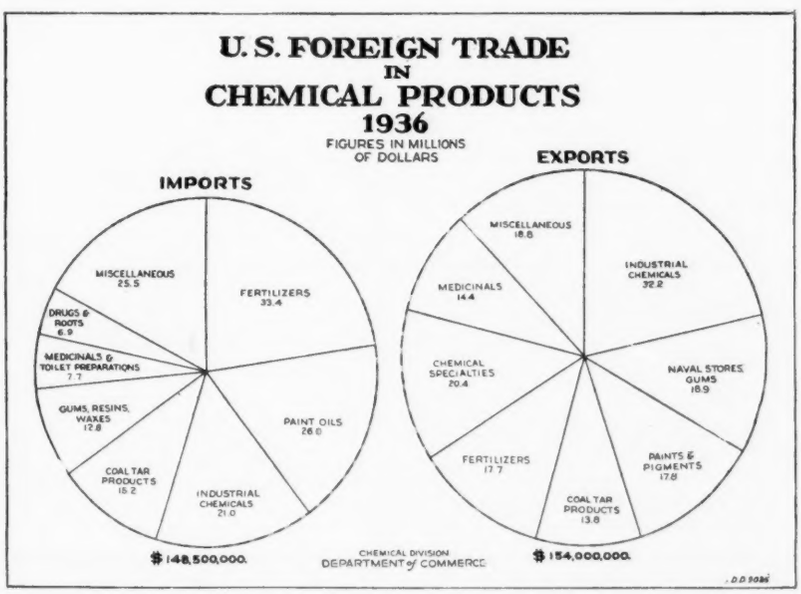
Canadian Expansion In Past Decade

Canadian chemical and allied product industries have attained considerable importance in the Dominion's industrial life during the past decade, particularly those branches which manufacture medicinals, toilet preparations, ready-mixed paints, and explosives, according to C. C. Concannon, chief of the Commerce Department's Chemical Division.

Reports recently issued by the Minister of Trade and Commerce of Canada indicate that the Dominion's output of chemical products is now about one-fifth that of the U. S. and that it employs approximately 30% as many workers.

Canada's chemical output during '35, based on factory selling prices, increased almost 10% compared with the preceding year to a total of $118,575,000, a gain of 28% over '33 and the highest value recorded for any year since '30, according to Canadian Minister of Trade and Commerce.

A total of 18,933 workers were employed in 734 plants during 1935, a gain of 10½% over the preceding year, and salaries and wages increased $2,700,000 to a total of $23,715,000, the census shows. Capital employed in Canada's chemical and allied product industries was reported at $147,472,000 in 1935, a figure slightly lower than that reported for the preceding year.



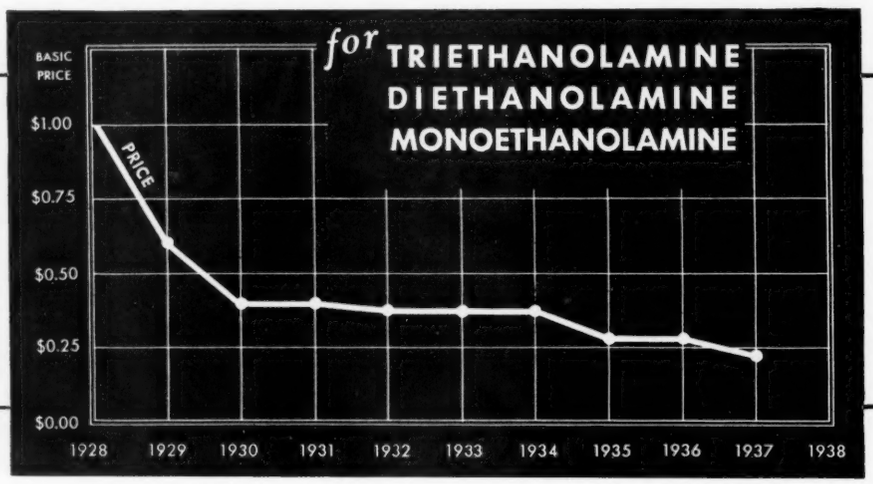
Noteworthy Foreign Developments

Foreign trade of the United Kingdom in fertilizer materials in '36 was characterized by a sharp decline in exports of sulfate and substantially heavier imports of phosphate rock.

World nitrogen consumption established a new peak in '36 during which year a total of 2,400,250 metric tons were used, chiefly as fertilizer, though the increase in consumption for other purposes during recent years has been noteworthy. During the past decade world consumption of this important element has increased more than 75%, estimates made by the British Sulphate of Ammonia Federation indicate.

It seems only yesterday that Imperial Chemical Industries was formed—but actually it is nearly 10 years ago since the great chemical merger was accomplished. "I.C.I.," the corporation's house organ,

Again . . Lower Prices



Product Improvement Through The Use of These Compounds Now Can Be Achieved Profitably.

SUBSTANTIALLY lower prices for these three compounds are now in effect... new cost calculations and additional experimentation are in order. New and improved products which have been shelved awaiting lower ethanolamine prices should now be reconsidered.

With lower prices, the use of one of the ethanolamines becomes more economical than ever in production of emulsions, soaps, cosmetics, polishes, textile specialties, leather compounds, insecticides, cutting oils, water paints, shellac and casein dispersions.

Chemically, the ethanolamines behave like alcohols or amines. Triethanolamine in particular enters into many reactions characteristic of polyhydric alcohols. All of the ethanolamines, being extremely hygroscopic liquids, are excellent moistening agents.

A wide range of products can be made with these amines. The booklet on "Emulsions" contains 57 proved formulae using Triethanolamine. This book, together with the new low prices, will be gladly forwarded upon request.

CARBIDE AND CARBON CHEMICALS CORPORATION

Unit of Union Carbide and Carbon Corporation

UCC

30 East 42nd Street, New York, N. Y.

PRODUCERS OF SYNTHETIC ORGANIC CHEMICALS

will celebrate the event by a special number in which there will be articles on the reasons for the amalgamation and how it was carried out and a concise history of I.C.I abroad.

The Italian Government has authorized the Mining Credit Section of the Banca di Italia to increase the amount of its interest-bearing bonds from 40 million to 50 million lire, this increase to be used in furnishing the necessary credits to the sulfur industry.

According to the Amsterdam correspondent of the British *Chemical Trade Journal* the long anticipated merger between the Union Chimique Belge S.A. and the Compagnie Chimique et Industrielle de Belgique, is likely to materialize at an early date, special meetings of shareholders having been called by both companies to consider the proposals.

The French Senate has approved the bill fixing the future of the Alsatian potash industry. The Domanial Mines will be converted into a public company in the direction and finance of which the State will take no part. The Sales Bureau already in existence will be amplified and will market the products not only of the Domanial Mines, but also of other present or future potash mines in France, Algeria, and the French Colonies.

Toovey, Paper Expert, Joins Penn. Salt

MacKelcan Elected Secretary, Innis, Speiden—Loeffler Is New Monsanto Assistant Eastern Manager—Others In New Positions—

Thomas W. Toovey has joined the staff of Penn. Salt. He has just returned to America after an extended trip through Norway, Sweden, and Finland where he visited pulp and paper mills.

Mr. Toovey first entered the pulp and paper field in '23. Five years were devoted to work with Canada International Pulp & Paper at Hawkesbury, Ont., where he was a member of the research department under Prof. Dr. Heuser. The following six years he was employed by the British Columbia Pulp & Paper Co., Port Alice, Vancouver. During the past two and one-half years, Mr. Toovey was in the research and bleaching departments of the Harmanec Pulp Mills at Harmanec, u.Banske Bystrice in Czechoslovakia. Here he was privileged to work under Dr. Ladd Rys, the bleaching expert known throughout the world.

Mr. Toovey is a chemical engineer and member of the Engineering Institute of Canada. His Canadian, American, and more recently, his wide European experience has admirably equipped him to assist the Pennsylvania Salt Manufacturing Company in handling pulp bleaching problems and their relation to the use and application of liquid chlorine. Mr. Toovey has been assigned to the Chlorine Sales Division and will be located at the Philadelphia executive offices.

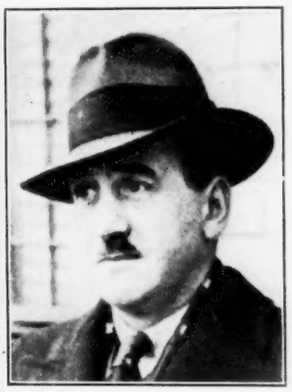
Succeeds C. L. Speiden

H. G. MacKelcan has been elected secretary of Innis, Speiden at a meeting of the board of directors on Jan. 5th to succeed C. L. Speiden, who resigned recently from the company.

Mr. MacKelcan has been associated with Innis, Speiden for 29 years, joining the organization as a junior clerk upon his graduation from East Orange High School. Since that time he has served the company in almost every capacity, and in '26 became general sales manager of the company and in '27 was made vice-president in charge of sales.

H. G. MACKELCAN

A. T. LOEFFLER



THOMAS W. TOOVEY

Prominent in the February personnel changes.

Loeffler Promoted

A. T. Loeffler, who became associated with Monsanto in a sales capacity several months ago, has been appointed assistant manager of Monsanto's Eastern District Office at 30 Rockefeller Plaza, N. Y. City. Mr. Loeffler was formerly with Hooker Electrochemical and is well known in the chemical industry.

Personnel Changes in February

E. N. Klemgard, former lubrication consultant at Pullman, Wash., is now director of manufacturing of Panther Oil & Grease Manufacturing Co., Fort Worth, Tex.

Dr. Clyde L. Thompson (of the University of Illinois) has become associated with the Harbison-Walker Refractories Co. as a member of its research staff.

Frank T. Barr, formerly on the teaching staff at Armour "Tech," is now with the development division of Standard Oil Development, Elizabeth, N. J.

Merle L. Griffin has been promoted as field representative of the technical products dept. of Shell Petroleum with headquarters at St. Louis. He will supply technical service on special naphthas and by-products.

Albert A. Hoffman has been chosen manager of the Trona operations of American Potash & Chemical to succeed W. E. Burke who has been forced to resign because of ill health.

Dean L. Smith has been transferred by Virginia-Carolina Chemical from the Ft. Wayne plant to be factory superintendent at Portsmouth, Va.

George B. Hughey, Alabama "Poly," is now a member of the staff of the chemical engineering dept. of Ohio State University, Columbus.

Carl H. Geister, recently with Mellon, has joined the technical laboratory staff of the dyestuff division of du Pont.

Martin M. Stuart, manager, glycerine sales, Colgate-Palmolive-Peet, has been appointed manager of industrial sales in addition to his present office. Mr. Stuart succeeds Arthur F. Danz who has joined Kirkman & Son as vice-president and general manager.

General Plastics announces the recent promotion of "Al" Hanmer to sales manager of Durez, molding compound. He formerly represented the company in the Chicago, Detroit area.

M. M. Makeever, president of the Makalot Corp., announces the appointment of R. G. Gates as technical director. Until recently Mr. Gates was director of technical service at John D. Lewis, Inc., of Providence, R. I. In his 16 years' experience in finishing materials and synthetic resins Mr. Gates has spent some years on the research staffs of Glidden, American Cyanamid and as assistant technical director of Murphy Varnish. Mr. Gates, who has several patents and a course in paints, varnishes, lacquers, and synthetic resins to his credit, is associated with the well known consulting chemist, Dr. Francis W. Brown of Philadelphia.

Bruce B. Wallace has joined the staff of the Los Angeles office of Foxboro, Foxboro, Mass., makers of industrial precision instruments. He will work out of Los Angeles as a sales engineer.

Stine Defends Invasion of Industry by Scientists

Reviews The Scientific Advances Of The Past Decade In An Address Before 300 Industrial Leaders At Cincinnati—Other Personal Items Of Interest—

An alliance of chemistry with other sciences to fight disease on a scale comparable to the nation's preparations against war was urged Feb. 19th by Dr. C. M. A. Stine, noted chemist and a du Pont vice-president, in a talk on contemporary problems before 300 business and professional men at the University of Cincinnati.

In such an alliance alone, said Dr. Stine, "lies hope and the possibility of great discoveries which will save thousands of lives and mitigate the terrific suffering, to say nothing of the huge economic toll, that disease now exacts of all of us."

DU PONT'S DR. C. M. A. STINE

"There is no need to fear that science is becoming the prostitute of commercialism."

Detailing at length chemical advances in all fields, Dr. Stine said that the country's awakening during the World War to the importance of organic chemistry, more specifically of synthetic new materials, had "marked the passing of economic leadership from the machine builder to the scientist and placed us on a plane of progress that begins where the plane of the Machine Age stopped."

Doctor Stine concluded: "There need be no fear of science becoming the prostitute of commercialism, as some seem to think. On the contrary, the widespread and growing invasion of industry by scientists is a wholesome sign. The scientists of our industrial research laboratories are the same men who, twenty years or so ago, found opportunities for work only in our universities and schools, or perhaps in the medical profession, or in some relatively obscure scientific bureau of the government. Indeed, many of them have come to industry from these sources, where they were honored and revered for their records of able and unselfish service to mankind.

"Industry is changing these men but little, if at all. The mere act of moving from one city to another, from one laboratory to another, from an old allegiance to a new one does not change human character. These are the men who have given ideals and altruism to our universities, and industry is now giving them opportunity for expression in a new field.

"It is asking but one thing of its scientists—to create, for the practical benefit of their fellow men."

Bischoff, Robins Estates

The late Dr. Ernst Bischoff, industrial chemist, who died on April 19, 1935, left a gross estate of $358,777 and a net of $237,874. He was for many years associated with the chemical end of the dyeing industry and in 1908 established the producing firm of Ernst Bischoff, Inc.

An inventory of the estate of George S. Robins, president of G. S. Robins & Co., was filed in probate court recently. It set the value of the estate at $211,461. Principal item was 1,746 shares of capital stock of the chemical company, valued at $174,600. His will left everything to his widow, Mrs. Bessie A. Robins.

Others In The News

James G. Marshall, general superintendent of Union Carbide and Electro Metallurgical companies, has been awarded the Schoellkopf Medal for 1937 by the western N. Y. section of the A. C. S.

Charles L. Huisking returned in the *Manhattan* on Feb. 20th. He visited England, Norway, and Germany.

W. T. Holliday, president of Standard of Ohio is president of the Cleveland '37 Great Lakes Exposition, and W. B. Lawson, vice-president, Harshaw Chemical, and J. G. Sholes, president, Ohio Chemical & Manufacturing, are trustees.

Ralph A. Clark, sales manager of J. T. Baker Chemical, Phillipsburg, N. J., gave a classification talk on acids at the meeting of the Easton Rotary Club at the Hotel Easton on Feb. 4th.

Fred M. Becket of Carbide research laboratories and A. C. S. president, E. R. Weidlein were among those elected to the board of trustees of the American Institute.

Cyanamid & Chemical Acquires H. A. Metz Co.

N. Y. Q. Appointed L. C. L. Jobbers By Mathieson Alkali—Monsanto's Rubber Service Laboratories Formally Opens New Service Laboratory—Other News Of The Companies—

American Cyanamid & Chemical has purchased H. A. Metz & Co., Inc., Newark, N. J., manufacturer of textile and tanning specialties. Merger of the Metz company, of which Harry Metz, son of the late Herman A. Metz, is vice-president, became effective as of March 1. Mr. Metz will continue with Cyanamid & Chemical.

N. Y. Q. To Job Alkalies

Appointment of N. Y. Quinine and Chemical, as less carload jobbers has just been announced by Mathieson Alkali. N. Y. Q., whose headquarters are at 99 N. 11th st., Brooklyn, N. Y., will handle Mathieson's light soda ash, solid and flake caustic, "bicarb" and aqua ammonia in the metropolitan area.

An Aid To The Rubber Industry

The Rubber Service Laboratories Division of Monsanto at Akron, Ohio, formally opened on Feb. 2nd, a new and larger service laboratory at that point to take care of the growing needs and new developments in the rubber industry. The Thomas & Hochwalt Laboratories Division will shortly complete a new laboratory building at Dayton, Ohio, which will be approximately 120 feet long and 50 feet wide, with 7 laboratories, a balance and instrument room and a lecture room which will be air conditioned. The building will be concrete and glass brick construction. Work in these new Dayton Laboratories will be devoted principally to physical-chemical projects.

Company News Of The Month

United Carbon, Charleston, W. Va., has made available a group life insurance plan for the benefit of its employees and their dependents. Plan will be underwritten by Equitable Life Assurance Society and will be operated on a cooperative basis.

Three firemen were injured in a spectacular fire at the South Boston warehouse of the Grasselli division of du Pont on Feb. 13th.

Manufacture of vanillin from sulfite liquor is to be started shortly by the Salvo Chemical Corp. of Rothschild, Wisconsin.

Russell-Hale Chemical, Houston, Texas, opened a warehouse and office in New Orleans at 858 S. Front st., in charge of Carl Sutter, well-known in the industrial chemical field in the New Orleans area.

Georgia Coating Clay Co. is a new kaolin producer at Macon, Ga.

Standard BICHROMATES

BICHROMATE OF SODA
•
BICHROMATE OF POTASH
•
CHROMATE OF SODA

PRIOR CHEMICAL CORP.

420 LEXINGTON AVENUE • NEW YORK

Selling Agents for

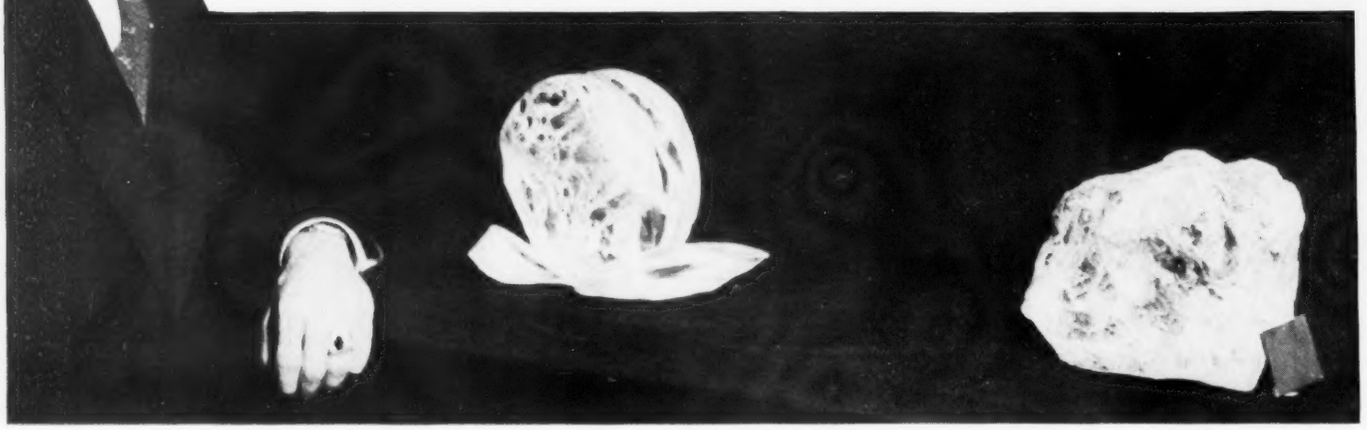
STANDARD CHROMATE DIVISION

Diamond Alkali Company, Painesville, Ohio

CHEMICAL

The Photographic Record

A demonstration showing the comparative refractive qualities of Lucite, du Pont's new plastic, and of quartz crystal was given recently at the New York Patent Law Ass'n annual dinner. Below, a mass of this resin, internally fractured, and a like formation of quartz crystal, each placed over a source of illumination. From this source light is projected through Corning filtered glasses of red, yellow, green, blue, and violet, into the crystal or plastic mass. Because each of these two materials has the same property of propagating light within itself, and because the internal fractures of the two masses are at various angles, the light is reflected from these interior surfaces in a myriad of angles.



Local chemical distributors never before occupied a more strategic position, and never before were their problems, thanks to the Robinson-Patman Act, more complicated yet more vital to the industry as a whole. Below, local distributor, Arthur Phillips, National Oil and Supply, Newark, N. J.

The accompanying group of photographs shows, above, left, distributors Harry L. Grund, Cleveland, O.; to the right, S. R. Benner, Benner Chemical, Chicago; below, left, Charles J. Kleinsteuber and Earl C. McNutt, Chemical Sales, Buffalo, N. Y.

NEWS REEL

of Our Chemical Activities

Dr. Lawrence Wade Bass, who recently rejoined the Mellon Institute, as a member of the executive staff.

E. J. Luster, American Catalin, who recently returned from England where he was active in arranging the details of the newly formed English affiliated company.

Sir Harry McGowan, chairman of Imperial Chemical Industries, Ltd., London, who has been elevated to the peerage.

The 99th anniversary of the founding of Eaton-Clark Company, Detroit, was celebrated in conjunction with the annual conference of the sales staff, followed by a dinner at the Detroit Athletic Club. Top row, V. N. Bigelow, R. F. McDonald, L. C. Leonard, F. Z. Douglas, R. W. Adams, W. H. Spreen, R. C. Leonard, B. B. Phelps, D. F. Simmons. Center row, G. T. McCray, R. P. Cole, B. C. Eaton, President; R. W. Clark, Chairman; R. C. Hedke, Vice-President and Managing Director; W. O. Emery, Secretary-Treasurer; A. Walz. Front row, H. P. Wilson, O. J. Moore, C. L. Elliott, H. K. Robinson, F. O. Beyer, M. E. Taylor.

MANUFACTURING CHEMISTS SINCE 1849

The "QUALITY" seal distinguishing Pfizer Products is more than a mark of purity and physical uniformity. Other essentials are very definitely in our quality background ... accurate control ... technical skill and well trained personnel throughout the organization ... modern equipment ... capacity ... the knowledge and the will to cooperate in special requirements ... strict observance of ethics applying to our industry.

CHAS. PFIZER & CO., INC. 81 MAIDEN LANE, NEW YORK 444 W. GRAND AVE., CHICAGO

P. & G. has started a weekly Tuesday morning network radio series for Drene shampoo, through H. W. Kastor & Sons Advertising Co., Chicago.

Sheffler-Gross Co., Drexel Bldg., Philadelphia, is now distributor in that area for American Car & Foundry's line of full area lubricated A. C. F. plug valves.

Uses that have been developed for neoprene are explained by du Pont in a special bulletin that has just been issued.

Kentucky Color & Chemical, Louisville, resumed production on Feb. 8th. Material in process and finished products were untouched in the recent flood.

Prior Chemical's popular house organ, "Priorities" for March will be largely devoted to interesting angles of leather as a finished product. The February issue dealt with various phases of tanning.

Rex Research, Toledo, maker of Fly-Tox Rex fly spray and other insecticide products, has picked Gordon Vlchek Advertising Agency.

Grand Rapids Varnish has formed a new subsidiary, Grand Rapids Paint & Enamel. Formal opening of the plant took place last month.

The current issue of *Monsanto Chemical Events* contains articles on abrasives, phosphoric acid and phosphates, and Liebig.

Devoe & Raynolds will spend nearly $500,000 this year in pushing sales of its two-coat system of exterior painting.

John O'Day, president, U. S. Dyestuff Corp., 140 Oliver st., Boston, announces the appointment of his company by the Fulton Dye & Import Co. as sole New England selling agents for the various products (dyestuffs, chemicals, etc.) manufactured by the following French chemical companies: Etablissements Kuhlmann, Saint Dennis Dyestuff & Chemical, Saint Clair-du-Rhone Dyestuff & Chemical, Mulhouse Dyestuff & Chemical.

Cyanamid and Plaskon have settled patent litigation, the two companies having granted each other licenses under their respective patents in the urea resin field.

Glidden had an unusual stimulation of business in January, with a 36.7% increase in sales over the same month a year ago.

New Construction

The Bopf-Whittam Corp., of Westfield, manufacturers of lanolin and other wool fat products, has purchased two acres of land in Linden, N. J. Plans are being prepared for a new plant for the corporation which will move its manufacturing activities to that city late in the spring or early summer.

General Plastics, N. Tonawanda, N. Y., will build two additions to cost $32,000.

Howard S. Gable plans the construction of a plant in Kansas City, Kans., for the manufacture of industrial, household, photographic, and agricultural chemical specialties.

Hilton-Davis Chemical, Cincinnati, has purchased 45 acres adjoining the present plant. Company will erect an additional unit early in the spring.

Isco Chemical Division of Innis, Speiden, has awarded a contract for construction of an addition to its carbonate of potash manufacturing unit.

At The Chemical Plants

In meeting the requirements of increased business, Archer Daniels Midland, large manufacturer of vegetable oils, has provided greater assurance of continuous service through a program of switchgear modernization at its Edgewater, N. J., plant, according to William A. Foley, plant engineer. The new switchgear installation, recently completed, includes 19 General Electric metal-enclosed cubicle units. In addition 6 large power transformers and 4 Pyranol-filled capacitor racks were installed to increase capacity and maintain power factor.

Armour Plant Destroyed By Fire

Estimates of damage done by a fire of undetermined origin that swept the Armour fertilizer plant, located one mile from Columbia, S. C., ranges from $50,000 to $130,000. Main two-story building of the plant was completely destroyed and 9,000 tons of fertilizer damaged. P. J. Zeigler, division manager for the company, stated that orders would be accepted at the plant as usual but for the time being they would be shipped from Armour plants in Augusta, Atlanta, and Wilmington. He also stated that a complete new plant would be built on the site of the one which was destroyed.

Conviction of Pfister Chemical, Ridgefield, N. J., for alleged violation of an ordinance to abate nuisances from the discharge of fumes, smoke and gaseous vapors was set aside by the N. J. Supreme Court last month.

A report submitted to Director of Public Works Eugene T. McCarthy of Bayonne, N. J., by City Engineer Walter L. Clarkson states that residents and property owners in the vicinity of Pharma Chemical, 169 W. 52nd st., who recently protested that there was a "health menace," have no cause for complaint.

A group of 5 engineers headed by George T. Felbeck, have arrived at the South Charleston plant of Carbide to work on the gas separation unit to be constructed on the mainland adjoining the main plant.

Alsop Engineering has just granted a general increase for those employees on an hourly basis at the new plant at Milldale, Conn.

The Aluminum Co. of America has announced a 10% increase for its 20,000 hourly rated employees. The wage increase is the third granted in 16 months.

Omaha Chemurgic Conference Discusses Corn

Seeks New Industrial Uses Through Research—Ceramic Society Members To Go To Havana—Leather Chemists Select Tentative Program—Additional Association News—

Problem of stimulating research to find new industrial uses for corn was a leading topic at the midwestern "farm chemurgic" conference, held in Omaha March 9th and 10th, with the Hotel Fontenelle as headquarters. Already science has found scores of products which can be manufactured from corn, C. J. Claassen, chairman of the meeting, declared, but the conference was called to mobilize the resources to industry, science and agriculture to find still others.

One entire session was devoted to corn, with F. A. Middlebush, president, University of Missouri, Columbia, presiding. Speakers and their topics included: Norman F. Kennedy, director of research, Corn Industries, Research Foundation, N. Y. City, on "Corn as an Industrial Raw Material"; R. M. Hixon, professor of chemistry, Iowa State College, Ames, on "Iowa Corn Research Institute"; J. F. Walsh, director of research, American Maize Products Co., Roby, Ind., on "Corn Proteins"; E. I. Fulmer, professor of chemistry, Iowa State College, Ames, on "Farm Products in the Fermentation Industry"; Leo M. Christensen, secretary-treasurer, The Chemical Foundation of Kansas Co., Atchison, on "The Practical Problems of Converting Farm Crops Into Alcohol"; O. R. Sweeney, professor of chemical engineering, Iowa State College, Ames, on "Stalks, Straw and other Cellulosic Materials as Industrial Raw Materials."

Three hundred scientists, farmers, and business leaders from 9 midwestern states attended the conference, which was sponsored by the Omaha Chamber of Commerce.

Association Briefs

Following the annual meeting of the American Ceramic Society at the Waldorf-Astoria, N. Y. City, March 21-27, a special cruise to Nassau and Havana has been arranged for the Easter holidays, leaving New York upon termination of the meeting, March 27th.

Members of the Institute of Vitreous Enamelers of England will be special guests of the Porcelain Enamel Institute at its 7th annual meeting in October. Chicago was selected as the place for the

STARKIE Pitch

A PURE SYNTHETIC PITCH

OTHER PRODUCTS

Vegetable Oils

Vegetable and Animal Fatty Acids

Naphthenic Acids

Asbestos Fibres

Bentonite

Tripoli

Talc

Carob Flour

A pure non-toxic synthetic pitch produced from a pure vegetable base. Available in the following melting-point ranges: 65-75; 85-90; 105-110; 115-125; 125-135; 145-150 degrees Fahrenheit.

Starkie's synthetic pitch is used extensively in the manufacture of the following: Asphalt Floor Tile, Various Bituminous Products, Insulating Impregnating Compounds, Paints, Paper, Insulation Materials, Waterproofing Materials, Sealing Compounds, Textile Products, Roofing, etc.

Write for detailed information regarding the use of this material. It may be the solution to one of your manufacturing problems. We welcome an opportunity to serve you.

A. E. STARKIE CO.

1645 S. KILBOURN AVE. CHICAGO, ILLINOIS

annual meeting this year. Tentative dates of Oct. 12-13th were sent. The hotel will be selected later.

The American Leather Chemists' Association tentative program for the 34th annual meeting was approved by the Council at a session of that group at the Newark Athletic Club on Feb. 19th. The annual meeting will be held in Toronto at the Royal York Hotel on June 8-11th.

The Chemical Club of Philadelphia will hold a dinner meeting on March 18th in the Locust Room of the Penn. A. C.

The American Potash Institute, Investment Bldg., Washington, D. C., has just started a new organ the title of which is "The Potash Journal."

A symposium on spun rayon and blending was a feature of the last meeting of the American Association of Technologists.

The National Safety Council, 20 N. Wacker Drive, Chicago, has just issued Safe Practices Pamphlet No. 14 on the subject of goggles.

Dr. F. Bonnet of the Viscose Co. spoke on the "Dyeing and Finishing of Spun Rayon" at the February meeting of the N. U. Chapter of the A. A. T. C. & C.

The Midwest Section of the Cereal Chemists was treated to a fine discussion of gelatine and its properties at the February meeting, when Jay Bowman, United Chemical Products, addressed the 50 members present. Mr. Bowman was introduced by Program Chairman, R. A. Barackman, Victor Chemical Works.

Announcement was made that the annual meeting of the American Association of Cereal Chemists would be held at the Nicollet Hotel, Minneapolis, May 24-28, 1937.

Fine Chemicals

The markets for fine chemicals and pharmaceuticals were relatively quiet and uneventful last month. The volume of business, however, was very satisfactory.

Important Price Changes

	Feb. 26	Jan. 30
ADVANCED		
Linalyl acetate	$1.60	$1.50
Glycerin C. P.	.29	.25
DECLINED		
Acid acetylsalicylic	$0.50	$0.55
Mercury metal	92.00	93.00
Potassium iodide	.93	1.10

Generally speaking the price structure was very firm and but very few important alterations in quotations were reported. Outstanding were a 5c reduction in acetylsalicylic acid and a 17c decline in potassium iodide. Both of these changes were the direct result of active competition between makers.

Quicksilver was off slightly but the reduction of one dollar per flask was so small that it did not affect the situation in the mercurials. Glycerine spot stocks are still practically unattainable. A few second hands are still open to propositions at a premium above the nominal quotations.

Roura and Forgas, of London, have been appointed sole importing buyers for marketing throughout the world the quicksilver of the Spanish Government-owned Almaden Mines. In regard to Italian mercury, it is understood that a recently formed company, Amalgamated Merchants, Ltd., of 14, Seething Lane, London, E.C., will undertake distribution of Italian mercury.

Further Rises in Copper Salts Feature the Market

Copper Sulfate Now Quoted At $5.75—Competition Drives Yellow Prussiate Of Potash Still Lower—Industrial Chemical Consumption Satisfactory—

The price feature in industrial chemicals last month was the continued rise in copper salts, the direct result, of course, of the advance in the metal to 15c. Increases in tin derivatives and antimony salts were placed in effect when these metals shot upwards in a generally advancing commodity price rise. Continued competitive pressure in the market for prussiates forced a downward revision for yellow prussiate of potash.

In the first half of the past month buyers appeared to be exercising extreme caution on commitments. This policy was easily understandable, however. With the clearing of the skys, so to speak, by the amicable settlement of the sit-down strike at the General Motors plants and the improvement in the flood areas, purchasing agents adopted a broader policy and as a result February tonnages compare favorably with the same month a year ago and were considerably ahead of January of the current year.

The outlook for March and the months immediately following is now very favorable. Prospects for sustained heavy production in the glass industry has been enhanced, of course, by the tremendous back-log that was built up as a result of the prolonged strikes at two of the principal plants. Consumption of newsprint in 1937 may reflect only a moderate increase over the record-breaking 1936 total, but if this promise is fulfilled all concerned will be most satisfied.

A detailed study of each and every important process industry which consumes industrial chemicals to any appreciable extent reveals the fact that they are all operating at high levels. This certainly forecasts heavy chemical consumption through the second quarter at least.

A favorable report was made to the Texas House on Feb. 18th by the Committee on Revenue and Taxation on the measure sponsored by Representative Harry Graves to increase the production tax on sulfur to $2 a ton, from $1.03.

Arguments against the proposed increase were made by attorneys for Texas Gulf Sulphur, Freeport Sulphur, and Jefferson Lake Oil. Harry Webb, representing Texas Gulf Sulphur, stated that his company is now paying 7% of the value of sulfur produced, while stockholders are receiving only 5% on their investment.

Important Price Changes

	Feb. 26	Jan. 30
ADVANCED		
Antimony	$0.15½	$0.14¼
Oxide	.15¼	.14¼
Copper acetate	.23	.22½
Copper carbonate	.17¼	.16¼
Copper metal	.15	.13
Copper sulfate	5.75	4.85
Sodium antimoniate	.15	.13¾
Tin crystals	.40	.37½
Metal	.5485	.497/8
Oxide	.57	.55
Tetrachloride	.27½	.25½
Tungsten metal	2.05	1.95
Wood flour	20.00	19.00
Zinc dust	.087	.079
DECLINED		
Potassium prussiate, yellow	$0.15	$0.16
Sodium molybdate	.65	.70
Sodium tungstate	.80	.85

Solvents

The "news" of the solvents markets in February was almost exclusively that dealing with the advances in petroleum solvents. In most quarters such action was not unexpected for firmer prices were discussed for several weeks before the turn of the year. Not only were tank car quotations advanced by most refineries but the tankwagon schedules in nearly all important industrial centers were revised upwards.

Important Price Changes

	Feb. 26	Jan. 30
ADVANCED		
Cleaners' Naphtha, East, tks.	$0.10	$0.09½
V. M. P. Naphtha, East, tks.	.10½	.10
Petroleum thinner, East, tks.	.09½	.09
Rubber solvent, East, tks.	.10	.09½
Stoddard solvent, East, tks.	.10	.09½
DECLINED		
None.		

Consumption Of Solvents Increases

Increased consumption of all solvents was reported. Resumption of operations at the General Motors' plants has increased the demand for lacquers, thinners, and solvents. Shipments to the Akron rubber center were also in much greater volume.

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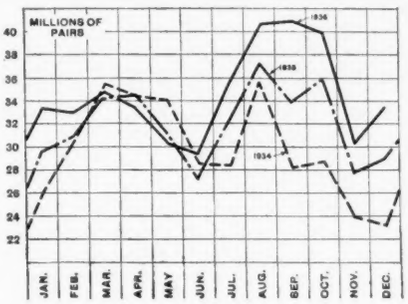
Textile, Tanning Chemicals

The markets for textile and tanning chemicals and specialties were without any spectacular happenings in the past month. While hand-to-mouth purchasing continued in many items the total volume placed was greatly in excess of the same month of last year and reflected the satisfactory state of activity in both industries.

Important Price Changes

	Feb. 26	Jan. 30
ADVANCED		
Zinc dust	$0.087	$0.079
DECLINED		
Sumac	$60.00	$65.00

The early incidence of Easter this year is bolstering activity in the textile industry. Hosiery shipments in 1936 topped the '29 figure and this satisfactory state of production has continued unabated so far this year. Only labor troubles in the rayon producing mills would cause a curtailment of manufacturing for the producers are practically booked to capacity for several months to come. Cotton spinning activity is very satisfactory, woolen factors report little idle producing capacity, and even the situation in silk has been improving rapidly of late. In some quarters it is felt, however, that the present rate of activity in cotton will not last for many more months.



Shoe production made a new record in '36.

What threatened to develop into a widespread New England shoe strike was averted at the last minute when the manufacturers capitulated to the union demands and granted a 15% wage increase. Boot and shoe production this year will probably just about equal the record-breaking 1936 output, and may even fall slightly below last year's level. Even so, tanners are optimistic at such a prospect, for the volume last year was very satisfactory.

Coal-Tar Chemicals

The past month in the coal-tar chemical markets was featured by improved demand for benzol with an accompanying strengthening in the price structure. Resumption of manufacturing operations by General Motors has forced the lacquer producers to increase their withdrawals of toluol, xylol, and solvent naphtha. The tire manufacturers with increased demands have aided in reducing benzol stocks.

Important Price Changes

	Feb. 26	Jan. 30
ADVANCED		
None.		
DECLINED		
Naphthalene	$2.80	$2.85

In contrast with the hectic market in naphthalene a few months ago the situation is now one of comparative tranquillity. With most of the refiners already booked and making ready for the active season suppliers of crude reduced their quotations 5c late last month.

The heavy demand from the resin field for phenol continues. The tight situation in cresylic remains unchanged with prices very firm and spot stocks scarce.

Dyes are moving out in satisfactory quantities to both the textile and leather trades. Intermediate manufacturers are experiencing some difficulties in making immediate shipment of certain of the more popular materials.

January activity in the coke industry was substantially at the same level as in December, although the trend of production still mounted. Total output of both byproduct and beehive coke amounted to 4,629,532 tons, or 151,027 tons per working day, an increase of 0.5% in comparison with the daily rate prevailing in December.

Production of byproduct coke for the month of January amounted to 4,357,632 tons, or 140,569 tons per day. Compared with December the rate advanced 0.2%, all of which occurred at furnace plants, where the average per working day was 1.4% higher than that of the preceding month. At merchant plants the rate declined 3.1%. Daily rate of pig iron production during the same period rose 3.1%.

Production of beehive coke for the month increased from 10,023 tons per day in December to 10,458 tons in January, a gain of 4.3%.

Stocks of coke at byproduct plants at the close of December were 9.0% less than at the beginning of the month. Bulk of the decrease occurred at merchant plants, where reserves were depleted by 10.7%.

Whitmore Gets Nichols Medal

Dean Frank C. Whitmore of the School of Chemistry and Physics of Penn. State, president-elect of the A. C. S., on March 5th received the William H. Nichols Gold Medal, highest distinction of the New York Section of the Society, at a dinner given jointly by the Section and the Society of Chemical Industry at the Hotel Pennsylvania.

More than 400 scientists representing many different fields of knowledge and investigation united in honoring Dean Whitmore, who was awarded the medal for studies in "metallo-organic compounds, especially those of mercury, and in the field of aliphatic chemistry, particularly in molecular rearrangements in the polymerization of olefins."

Dr. Walter S. Landis, Cyanamid vice-president and chairman of the Nichols Medal Jury of Award, presented the Medal, which was established in 1902 by the late Dr. William H. Nichols, leader of the chemical industry in the U. S. and a charter member of the A. C. S., to "stimulate original research in chemistry." Dean Whitmore, in his address of acceptance, discussed recent research on polymerization and the genesis and interrelation of his chemical investigations.

Prof. Marston T. Bogert of Columbia, past president of the A. C. S., spoke on the Medalist's scientific achievements, and Dr. Gerald L. Wendt, director of the American Institute of the City of New York, outlined the Medalist's personal career.

Paints, Varnish, Lacquer

Quotations for lead pigments were again sharply advanced last month to keep pace with the rapidly rising metal market. In most quarters the opinion was freely expressed that the end is still not in sight. While unquestionably speculation is an important factor at the moment in both lead and zinc prices, nevertheless, the war fever in Europe is draining international surplus supplies very rapidly and the statistical positions of both metals are very bullish factors.

Important Price Changes

	Feb. 26	Jan. 30
ADVANCED		
Litharge	$0.08½	$0.07½
Orange mineral	.12½	.11¼
Red lead, 95%	.09½	.08½
97%	.09¾	.08¾
98%	.10	.09
Resinate	.16½	.14
White	.08¼	.07¼
Basic sulfate	.07½	.06¾
DECLINED		
Casein, standard	$0.18¾	$0.19¼
80-100	.19¼	.20

Manufacturers of stearates are expected to offer new contracts late in the current month and in view of the higher prices for stearic acid increased prices for the stearates appear to be almost a certainty.

Optimistic Over Paint Outlook

Paint manufacturers are very optimistic over the prospects for this season and are, accordingly, arranging their production schedules to meet a demand that is expected to come close to if not equal to the record sales of 1929. Suppliers of raw paint materials report that the demand is at record proportions for many items.

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Fertilizer Outlook Promising for Coming Season

Organic Ammoniates Decline Still Further—January Tag Sales Highest For That Month Since '30—Foreign Fertilizer Trade Expands—Superphosphate Production—

Dealer interest in mixed goods improved considerably in the last half of March. It is not perfectly clear why the season is somewhat late but the producers are very optimistic over the outlook for the current year. Wet weather in certain parts of the South has temporarily retarded purchasing and the recent floods are another partial explanation advanced. Even so fertilizer tag sales in the South in January indicate the largest tonnage for any January since 1930. Furthermore, the price structure is expected to hold together much better this season than last.

The most important price changes of the month were in the organic ammoniates. The high levels reached in dried blood, nitrogenous material, and tankage in the fall of last year were largely artificial. With the mixers actually in the frame of mind to place business a more natural price level has been reached in the past 6 weeks or so. A good call was reported for both nitrate and sulfate. Trading in potash was quiet and uneventful. Superphosphate producers are talking about a stronger position in the coming season but nothing definite on the price situation has developed to date.

415,738 Tons In January

Fertilizer tax tag sales in 12 southern states totaled 415,738 tons, largest tonnage reported for any January since '30 and representing an increase of 22% over January of last year. Eight of the reporting states registered increases over last year, with Virginia and South Carolina showing the largest rises in tonnage. In the last 3 years January sales in the South accounted for 8.6% of the year's total.

Rising to the highest total in many years, sales in the southern states in the first 7 months of the current fiscal year, from July through January, aggregated 1,081,598 tons, a gain of 26% over the corresponding period of last year. Arkansas was the only state to report smaller sales this year than last.

With Kentucky and Missouri showing marked declines, total sales in the 5 reporting midwestern states in January were 14% less than in January '36. A particularly sharp rise occurred in Indiana. In the '34-'36 period January sales accounted on the average for only 3.0% of the year's sales.

Each of the midwestern states reported a substantial increase in the July-January period over the corresponding period of recent years, with aggregate gains over the preceding year amounting to 43%.

Important Price Changes

	Feb. 26	Jan. 30
ADVANCED		
Nitrogenous mat., East	$3.90	$3.60
DECLINED		
Blood, N. Y.	$3.90	$4.50
Chicago	3.90	4.65
Imported	3.90	4.10
Nitrogenous mat., West	3.40	3.50
Tankage, grd., N. Y.	4.00	4.40
Unground	3.90	4.35
Chicago	3.75	4.00
Imported	4.00	4.25

Foreign trade in fertilizers and fertilizer materials continued in '36 the upward trend begun in '33. Export tonnage was the largest on record and exceeded imports for the 3rd successive year.

Total exports are placed at 1,850,256 short tons with a stated value of $17,750,489, exceeding '35 by 11% in tonnage and 20% in value. Substantial increases were recorded in exports of sulfate, phosphate rock, superphosphate, and potash. Potash exports last year were 23% as large as potash imports; the ratio was 13% in '35 and 6% in '34. Exports of synthetic nitrate again fell off in '36, following the decline in '35.

Imports rose last year to the highest point reached since '30. Totaling 1,756,031 short tons valued at $35,109,255, they exceeded '35 by 12% in volume and 19% in value. Rise in imports of nitrogenous materials much more than offset the decline in potash imports. In spite of the sharp rise in domestic production, importations of sulfate in '36 were almost double those of the preceding year, increasing much more than did exports. Tankage was imported in much larger volume, reflecting the rise in prices in this country. The only decline in the 12 classes of imported nitrogenous materials was in urea and calurea. All kinds of potash materials were imported in smaller volume in '36 than in '35 with the exception of nitrate of potash.

December was the 10th consecutive month in which superphosphate production was larger than in the corresponding month of the preceding year. Total production in '36 was the largest reported for any year since '30, exceeding '35 by 18%, and somewhat more than twice as large as '32, the depression low year.

Rise in shipments kept pace with the increased production, with increases shown in '36 in all types of shipments by reporting acidulators. As compared with '35, shipments to mixers rose 30%, to consumers 21%, and in base and mixed goods 10%. Increases were about uniform in the two areas, except that shipments of superphosphate in mixed goods showed a much larger rise in the Northern Area than in the Southern Area.

Stocks of bulk superphosphate at reporting plants at the end of '36 were 7% less than a year earlier, but there was a 7% increase in superphosphate in base and mixed goods.

Fertilizer Tax Tag Sales* for Seventeen States for the Month of December and Totals for the Last Three Calendar Years

(Compiled by The National Fertilizer Association)

	December				Calendar Years			
	% of 1935	1936 Equiv. Tons	1935 Equiv. Tons	1934 Equiv. Tons	% of 1935	1936 Equiv. Tons	1935 Equiv. Tons	1934 Equiv. Tons
South:								
Virginia†	109	10,021	9,218	225	102	386,474	378,536	336,015
N. Carolina	154	49,317	31,980	22,200	104	1,038,920	1,000,071	876,874
S. Carolina	206	20,382	9,888	19,375	102	626,446	613,561	572,279
Georgia	403	10,472	2,600	12,904	111	684,522	617,439	549,275
Florida†	134	68,465	50,926	34,841	123	512,577	418,239	423,032
Alabama	24	1,300	5,500	3,600	111	467,700	422,400	358,450
Mississippi	77	5,364	7,000	104	112	239,027	214,015	162,067
Tennessee†	...	167	0	600	122	117,305	96,444	92,458
Arkansas‡	350	3,500	1,000	0	123	48,931	39,630	41,620
Louisiana†	170	5,750	3,390	1,500	127	117,106	92,532	76,326
Texas†	141	3,240	2,305	2,115	106	65,549	61,802	55,923
Oklahoma	...	0	0	200	91	6,055	6,619	4,990
Total South	144	177,978	123,807	97,664	109	4,310,612	3,961,288	3,549,309
Midwest:								
Indiana	33	31	94	212	128	250,214	194,946	149,003
Illinois	...	75	0	263	139	34,895	25,151	20,283
Kentucky	...	0	40	0	122	89,392	73,502	62,520
Missouri	...	90	0	41	158	93,588	59,398	52,259
Kansas	...	30	0	25	153	11,170	7,298	5,499
Total Midwest	169	226	134	541	133	479,259	360,295	289,564
Grand Total	144	178,204	123,941	98,205	111	4,789,871	4,321,583	3,838,873

* Monthly records of fertilizer tax tags are kept by State control officials and may be slightly larger or smaller than the actual sales of fertilizer. The figures indicate the equivalent number of short tons of fertilizer represented by the tax tags purchased and required by law to be attached to each bag of fertilizer sold in the various States.

† Cottonseed meal sold as fertilizer included.

‡ Excludes 54,800 tons of cottonseed meal for the calendar year, but no separation is available for the amount of meal used as fertilizer from that used as feed.

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Stock Values Rose 1.1% in February

Ten Leading Chemical Companies' Stocks Show Less Than 1% Depreciation—Complete Chemical List On The N. Y. Stock Exchange Shows Net Loss—Favorable Earning Statements—

Stock values rose but 1.1% in February, according to a compilation made by the *N. Y. Sun*. This compares with a gain of 2.8% in January. During practically the entire month a very thin market prevailed. Rallies were short-lived and there was no snap to the trading.

Nine groups appreciated last month the amusement, food, leather, mining, oil, rail, tire, steel and sugar stocks. Mining shares led with an advance of 13.2%, while steels were second with an appreciation of 12%, and tire stocks ranked third with an appreciation of 10%.

In contrast the chemical stocks again failed to make any appreciable headway, the total decline for 10 prominent common chemical stocks being under 1%. The January appreciation was approximately 1%.

The changes in net value for 10 of the leading common chemical stocks are given:

Air Reduction	— $4,433,565
Allied Chemical	— 7,213,056
Commercial Solvents	— 2,966,498
du Pont de Nemours	— 19,364,987
Freeport Sulphur	unchanged
Mathieson Alkali	— 643,643
Monsanto Chemical	— 1,671,582
Texas Gulf Sulphur	+ 2,880,000
Union Carbide	+ 6,920,203
U. S. Ind. Alcohol	+ 244,524
Total depreciation	$26,248,594

Both the *N. Y. Sun* figures showed a slight loss for 10 selected stocks and the report of the N. Y. Stock Exchange indicates a slight net loss for the entire chemical group. On March 1st the net value of all chemical stocks amounted to $6,573,366,524, as against $6,649,478,222 on Feb. 1st, a net loss of $76,111,698 for the month. The average price on March 1st was $80.41, as against $81.40 on Feb. 1st, a net loss of $0.99.

Earning Statements

Pamphlet report of Freeport Sulphur (formerly Freeport Texas) and subsidiaries for year ended Dec. 31, '36, certified by independent auditors, shows net income of $2,009,783 after depreciation, depletion, federal and state income taxes, $12,000 surtax on undistributed profit and after provision for $191,185 proportion of loss of Cuban-American Manganese Corp. and subsidiaries applicable to stock held by Freeport Sulphur. This net profit is equal after 6% preferred dividends, to $2.43 a share (par $10) on 796,380 shares of common stock.

For year ended Dec. 31, '35, company reported net income of $1,492,108 before deduction of $64,910 losses of Cuban-American Manganese Corp. equal to $1.78 a common share.

Annual report for the year '36 of du Pont, shows earnings applicable to the common stock of $83,557,740 or $7.56 a share on 11,049,470 average shares outstanding. Earnings for '35 on the common were $55,676,881, or $5.04 a share on 11,050,399 shares. Figures for both years include du Pont Company's equity in undivided profits or losses of controlled companies not wholly owned. Income account shows net income of $89,884,449, equal to 13.7 times the debenture stock dividend for the year.

Better Demand For Lacquer Solvents

Business of Commercial Solvents, with increasing volume in sales of butyl alcohol and butyl acetate for lacquers, showed a sharp upturn in the final months of '36.

Earnings last year showed a decline from '35, net equaling 84c a capital share against $1.02 a share in '35. The decrease was due partly to lack of profit from Commercial Molasses and partly because it was deemed advisable to store rather than sell whisky made during the last 3 months of the year.

"This decision," William D. Ticknor, president, states, "while adversely affecting earnings for '36 should favorably affect future earnings."

In his remarks to stockholders Mr. Ticknor calls attention to the improved industrial position of butyl alcohol.

Record Carbon Black Sales

New records in sales of carbon black and natural gas, with a consequent new peak in net income, were reported by United Carbon for 1936. Report shows net profit of $2,202,850 after depreciation, depletion, minority interests, federal and state income taxes and $53,000 surtax on undistributed profits, equivalent to $5.54 a share on 397,885 no-par shares of common stock outstanding. This compares with $1,872,405 or $4.70 a common share in '35. The net gain was 18% in '36.

Mathieson's Best Year Since '31

Earnings of Mathieson Alkali for the year ended Dec. 31st were the best since '31, amounting to $1,628,480 or $1.76 a share on 830,428 shares of common against $1,359,776 or $1.44 in the preceding year. Gross operating income of over $3,600,000 was at the best level in the company's history but record depreciation charges, amounting to slightly more than net profit, reduced final showing for the year.

Dividends and Dates

Name	Div.	Stock Record	Payable
Archer-Daniels-Midland	50c	Feb. 18	Mar. 1
Armour & Co., 7% pf., q	$1.75	Mar. 10	Apr. 1
Armour & Co., $6, pf., q	$1.50	Mar. 10	Apr. 1
Armour & Co. (Ill.), int.	15c	Feb. 23	Mar. 15
Atlantic Refining, q	25c	Feb. 23	Mar. 15
Atlas Powder	75c	Feb. 26	Mar. 10
Borne-Scrymser	75c	Mar. 20	Apr. 15
California Ink, q	62½c	Mar. 22	Apr. 1
Canadian Industries, Ltd.	$1.50	Mar. 19	Apr. 1
Canadian Industries, pf., q	$1.75	Mar. 31	Apr. 15
Clorox Chemical, q	75c	Mar. 15	Mar. 25
Colgate-Palmolive-Peet, q	12½c	Feb. 5	Mar. 1
Colgate-Palmolive-Peet, pf., q	$1.50	Mar. 5	Apr. 1
Columbian Carbon, sp.	50c	Feb. 15	Mar. 10
Columbian Carbon, q	$1.00	Feb. 15	Mar. 10
Compressed Industrial Gases, q	50c	Mar. 4	Mar. 15
Devoe & Raynolds, A & B, q	75c	Mar. 20	Apr. 1
Devoe & Raynolds, pf., q	$1.75	Mar. 20	Apr. 1
du Pont, interim.	75c	Feb. 24	Mar. 15
du Pont, deb., q	$1.50	Apr. 9	Apr. 24
Eagle Picher Lead	10c	Mar. 10	Apr. 1
Eagle Picher Lead, pf., q	$1.50	Mar. 10	Apr. 1
Freeport Sulphur, q	25c	Feb. 15	Mar. 1
Freeport Sulphur, 6% pf., q	$1.50	Apr. 15	May 1
Glidden Co., q	50c	Mar. 17	Apr. 1
Glidden Co., pf., q	56¼c	Mar. 17	Apr. 1
Great Western Electro. Chem., pf., q	30c	Mar. 20	Apr. 1
Hercules Powder	$1.50	Mar. 12	Mar. 25
Heyden Chemical	50c	Feb. 18	Mar. 1
Heyden Chemical, pf., q	$1.75	Mar. 22	Apr. 1
Internatl. Nickel	50c	Mar. 1	Mar. 31
Koppers, 6%, pf., q	$1.50	Mar. 12	Apr. 1
Lindsay Light & Chem., 7% pf., q	17½c	Mar. 6	Mar. 15
Liquid Carbonic, q	65c	Mar. 16	Apr. 1
Mathieson Alkali, q	37½c	Mar. 5	Mar. 31
Mathieson Alkali, pf., q	$1.75	Mar. 5	Mar. 31
Monsanto Chem., ext.	25c	Feb. 25	Mar. 15
Monsanto Chem., q	25c	Feb. 25	Mar. 15
Nat. Lead, Cl. A, pf., q	$1.75	Feb. 26	Mar. 15
Nat. Lead, q	12½c	Mar. 12	Mar. 31
N. J. Zinc, ext.	50c	Feb. 26	Mar. 10
Penick & Ford	75c	Mar. 1	Mar. 15
Penn. Salt	$1.25	Feb. 27	Mar. 15
Procter & Gamble, 5%, q	$1.25	Feb. 25	Mar. 15
St. Joseph Lead	50c	Mar. 5	Mar. 20
Sherwin-Williams, 5% pfd., q	$1.25	Feb. 15	Mar. 1
Sherwin-Williams, 7% pf.	$1.75	Feb. 15	Mar. 1
Socony-Vacuum	25c	Feb. 18	Mar. 15
Spencer Kellogg, q	40c	Mar. 15	Mar. 31
Swan Finch Oil, 7% ac.	$2.62½	Mar. 2	Mar. 16
Texas Gulf Sulphur, q	50c	Mar. 1	Mar. 15
United Dyewood, q	25c	Mar. 10	Apr. 1
United Dyewood, pf., q	$1.75	Mar. 10	Apr. 1
Westvaco Chlorine Prods., q	25c	Feb. 10	Mar. 1

In remarks to stockholders, E. M. Allen, president, says, "Sales contracts for 1937 show continued firmness in prices with moderate advances for certain products. Preliminary estimates of our customers' requirements indicate increased shipments in 1937 over 1936."

Nat. Lead Nets $7,232,530

Net profit of National Lead and domestic subsidiaries amounted to $7,232,530 in 1936 after deducting depreciation, depletion, federal taxes and other charges. After dividend requirements on the preferred A and B stocks the net profit is equal to $1.71 each on 3,095,100 shares of $10-par common stock now outstanding,

excluding 3,210 shares held in the treasury. In addition to this income, the company had equity in undivided profits of foreign subsidiaries and controlled companies not wholly owned, estimated at 12c a share on the common. Earnings of the two German companies are not included in this estimate.

In 1935 net profit was $5,261,390, equal, after preferred dividend payments, to $1.07 a share on the present number of common shares outstanding. Company's equity in undivided profits of foreign subsidiaries and controlled companies not wholly owned in that year was estimated at 12c a common share, on the basis of the present number of common shares.

Sales for the year amounting to $78,764,589 represent an increase of 18.3% over sales of $66,559,197 the year before.

Additional Earnings Report

Statement of Borne Scrymser (manufacturer of oils and greases) as of Dec. 31, 1936, shows total assets of $1,698,017 comparing with $1,665,114 at end of '35. Profit and loss surplus was $133,184 against $127,296 at close of preceding year. Capital stock (par $25) amounts to $1,000,000.

Report of Celanese Corp. of America and wholly-owned subsidiaries for year ended Dec. 31st, certified by independent auditors, shows net income of $4,406,993 after depreciation, interest, federal income taxes and approximately $85,000 surtax on undistributed profits. This is equal after dividends on 7% prior preferred stock, and under participating provisions of the first participating preferred stock, to $8.69 a share on 148,179 shares of 7% first participating preferred stock and $2.25 a share on 1,000,000 no-par shares of common stock.

This compares with net profit in '35 of $4,057,227, equal after prior preferred dividends, to $8.49 a share on participating preferred stock and $1.99 a share on common.

Chickasha Cotton Oil and wholly owned subsidiary, Guymon Investment—Six months to Dec. 31: Net income $73,049, equal to 28c each on 225,000 shares of $10-par capital stock, compared with $214,190, to 84c a share in second half of 1935.

Darco Corp. for 1936: Net loss, $19,265, against $1,795 loss the year before, when results of subsidiary were included. Atlas Powder holds 69% of preferred and 67% of the common.

Penn. Salt—$10.59 A Share

Report of Penn. Salt for 12 months ended Dec. 31st, shows net profit of $1,589,201 after depreciation, depletion, federal income taxes, surtax on undistributed profits, etc., equivalent to $10.59 a share on 150,000 shares of capital stock. This compares with $1,160,654 or $7.74 a share for the 12 months ended Dec. 31, '35.

Earnings Statements Summarized

Company:	Annual dividends	Net income 1936	Net income 1935	Common share earnings 1936	Common share earnings 1935	Surplus after dividends 1936	Surplus after dividends 1935
Archer-Daniels-Midland:							
**Dec. 31 quarter	*k*$3.00	$640,442	$411,553	$1.07	$0.65	*	*
Six months, Dec. 31	*k*3.00	1,163,886	808,613	1.92	1.27	*	*
Consolidated Chemical Industries:							
Year, Dec. 31	1.50	643,833	501,374	2.01	1.56	.....	.....
du Pont:							
Year, Dec. 31	*k*6.10	89,884,449	62,085,410	*j*7.56	*j*5.04	15,924,366	12,582,831
Mathieson Alkali:							
Year, Dec. 31	1.50	1,628,480	1,359,776	1.76	1.44	216,296	*d*52,749
National Oil Products:							
Year, Dec. 31	*k*2.80	559,097	337,949	*h*3.30	*h*2.16	.....	.....
New Jersey Zinc:							
Dec. 31 quarter	2.00	1,657,204	1,323,784	.84	.67	675,572	342,152
Year, Dec. 31	2.00	5,250,789	4,666,000	2.67	2.37	342,629	*d*242,160
Pennsylvania Salt Mfg.:							
Twelve months, Dec. 31	$4.00	1,589,201	1,160,654	10.59	7.74	.....	.....
Standard Oil Co. of Kans.:							
Year, Dec. 31	*k*1.00	257,081	131,748	....	....	.....	.....
United Carbon:							
Year, Dec. 31	*k*4.05	2,202,850	1,872,405	5.54	4.70	830,147	919,616

** Indicated quarterly earnings; *k* Paid in year 1936; * Not available; *j* On average shares; *d* Deficit; *h* On shares outstanding at close of respective periods; § Plus extras.

Annual Reports Analyzed

Company:	Fixed chgs. times earn.	Pfd. div. times earned	Cash and mark. securities	Inventories	Ratio-cur. assets to cur. liab.	Working capital
Atlas Powder:						
Year, Dec. 31, 1936	No fd. dbt.	3.73	$4,172,853	$2,886,449	7.5	$8,286,374
Year, Dec. 31, 1935	No fd. dbt.	2.53	4,373,856	2,524,708	10.8	8,109,835
du Pont:						
Year, Dec. 31, 1936	*c*	13.70	75,815,356	50,547,571	4.8	122,922,479
Year, Dec. 31, 1935	*c*	9.47	70,126,641	44,571,517	6.4	121,449,400
Hercules Powder:						
Year, Dec. 31, 1936	No fd. dbt.	7.25	*5,161,159	7,955,864	6.4	15,055,589
Year, Dec. 31, 1935	No fd. dbt.	4.49	*6,960,585	6,162,352	10.1	14,611,268
Industrial Rayon:						
Year, Dec. 31, 1936	No fd. dbt.	No pfd.	*9,023,067	698,049	9.1	9,531,519
Year, Dec. 31, 1935	No fd. dbt.	No pfd.	*7,850,837	1,729,208	10.2	9,419,121
Mathieson Alkali:						
Year, Dec. 31, 1936	No fd. dbt.	9.78	†807,209	1,808,160	3.4	2,601,209
Year, Dec. 31, 1935	No fd. dbt.	8.17	†523,909	1,820,523	2.0	1,580,505

* Securities carried at cost.

du Pont's Interim Dividend

Directors of du Pont have declared the first quarterly "interim" dividend for '37 of 75c a share on the outstanding common, payable March 15th to stockholders of record Feb. 24th.

The declaration of an "interim" dividend at this time conforms to the change in the Company's policy of dividend declarations on its common, announced recently.

Regular quarterly dividend of 1½% ($1.50) on the company's debenture stock was also declared, payable April 24th to stockholders of record April 9th.

Dow To Call Bonds

At a meeting of the board of directors of Dow Chemical held Feb. 23rd, it was decided to call for redemption on March 31, 1937, all of the Series E 2½% Serial Notes dated Jan. 1, '35, in the principal amount of $720,000.

Hercules Declares Dividend

Board of directors of Hercules Powder on Feb. 24th declared a dividend of $1.50 a share on the common. This is payable March 25th, to stockholders of record at the close of business on March 12th.

Sees Higher Zinc Pigment Prices

In answer to a stockholder's question at the annual meeting of N. J. Zinc, as to the outlook for 1937, J. E. Hayes, president, said that the company, being a producer of semi-finished materials, is dependent upon operations of heavy industries. However, if the results of the first two months are any criterion, 1937 should be a "wonderful year," he said.

Mr. Hayes stated he expects higher prices for pigments. An increase is bound to come soon, probably about the first of April, or the first of July, he declared.

St. Joe. To Pay 50c Dividend

A dividend of 50c a share has been declared by St. Joseph Lead. In 1936 10c was paid in March, 20c each in June and September and 50c in December.

Catalog Of Technical Books

For the first time, there is now available, a comprehensive catalog of technical books of all American and British publishers. Thousands of books are listed and each is fully described in the attractive, spiral-wire bound catalog No. 4 of the Chemical Publishing Co. of N. Y., Inc., 148 Lafayette st., N. Y. City. Because of the expense in getting up this catalog, a nominal charge of 10c is made to cover mailing expenses.

In New Locations

Imperial Oil & Gas Products has moved its general offices to the 12th floor of the Grant Bldg., Pittsburgh.

James H. Devine Co., Chicago dealer, has moved to 629 W. Washington Blvd., and the new phone is Haymarket 3510.

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Chemical Stocks and Bonds

Feb. Last	1937 High	1937 Low	1936 High	1936 Low	1935 High	1935 Low	Sales	Stocks	Par $	Shares Listed	Dividends*	Earnings** $-per share-$ 1936	Earnings** $-per share-$ 1935
							Number of shares						
NEW YORK STOCK EXCHANGE							Feb. 1937	1937					
73¾	80¼	73¼	86½	58	57½	35	18,700	38,400	Air Reduction	No	2,523,864	$2.50	.....	2.10
233	242	225	245	157	173	125	9,500	21,500	Allied Chem. & Dye	No	2,214,099	6.00	.....	8.71
89	101½	83	89	49	57¾	41½	4,700	17,200	Amer. Agric. Chem.	No	210,934	2.50	4.71	6.37
27⅝	29⅜	26⅜	35⅜	20½	35¼	22½	25,200	47,200	Amer. Com. Alcohol	20	260,716	.50	.....	3.16
44	46	41	50	37	52	36	6,500	14,700	Archer-Dan-Midland	No	549,546	3.00	3.20	3.46
81	85⅛	72¼	84	48	48½	32¾	2,600	6,200	Atlas Powder Co.	No	248,660	3.50	4.21	2.81
128	133	126¾	131	112	115	106¾	220	800	5% conv. cum. pfd.	100	88,781	5.00	.....	16.93
35¾	36¼	26⅜	32¼	21¾	35⅜	19½	258,800	449,500	Celanese Corp. Amer.	No	987,800	1.50	2.25	1.99
112	112½	106½	116	106	111¼	97½	1,600	3,400	prior pfd.	100	263,668	7.00	.....	.....
20	21⅝	19⅛	21¼	13	21	15⅛	80,800	174,400	Colgate-Palm.-Peet	No	1,985,812	.75	.....	1.36
103½	104½	103	106½	100	107¼	101	3,100	5,200	6% pfd.	100	254,500	6.00	.....	16.79
115½	124½	115½	136½	94	101¼	67	3,300	8,000	Columbian Carbon	No	538,154	5.75	.....	5.56
18½	21¼	18⅛	24⅝	14¼	23⅞	16½	158,300	485,000	Commercial Solvents	No	2,635,371	.80	.84	1.02
67	71¼	65⅞	82½	63⅝	78⅜	60	24,700	54,500	Corn Products	25	2,530,000	3.75	.....	2.62
163½	171½	163½	170	158	165	148¼	1,300	2,300	7% cum. pfd.	100	243,739	7.00	.....	33.97
70½	76⅛	61	63	42	50⅜	35½	4,400	7,300	Devoe & Rayn. A	No	95,000	2.00	4.49	2.89
171	180⅛	169	184¾	133	146½	86⅜	27,000	65,100	DuPont de Nemours	20	11,049,470	6.10	7.56	5.04
133½	135½	131½	136½	129	132	126⅞	1,600	3,800	6% cum. deb.	100	1,092,699	6.00	84.21	56.81
169⅜	175¼	167½	185	156	172¼	110½	8,400	15,400	Eastman Kodak	No	2,250,921	6.75	.....	6.90
161	163	159	166	152	164	141	310	430	6% cum. pfd.	100	61,657	6.00	.....	258.09
29½	32¼	26¾	35⅝	23½	30⅝	17¼	30,500	125,900	Freeport Texas	10	796,380	1.00	2.43	1.78
115	115½	109½	135	108	125	112½	70	150	6% conv. pfd.	100	25,000	6.00	.....	121.30
48	51½	43⅝	55¼	39½	49½	23⅜	36,300	95,100	Glidden Co.	No	603,304	2.00	3.29	2.91
55½	58⅛	54½	56	52¼			3,800	6,500	4½% cum. pfd.	50	200,000	2.25	15.43	.....
107	107	101	133	99⅜	119½	85	3,000	7,500	Hazel Atlas	25	434,409	7.64	.....	7.58
174	185	150½	5⅞	2⅞	90	71	3,500	9,700	Hercules Powder	No	583,672	5.44	6.33	4.23
131	135½	129¾	47¼	22¾	131	122	400	470	6% cum. pfd.	100	105,765	6.00	48.97	36.30
38¾	40½	36¼	66⅜	43¼	36⅜	23½	54,900	87,200	Industrial Rayon	No	606,500	2.10	2.24	1.00
8	8¾	5	30	23	5	2⅜	114,700	303,400	Intern. Agricul.	No	436,049	None	.....	1.55
54	59½	42	36¾	29¾	42¾	26	11,400	50,800	7% cum. pr. pfd.	100	100,000	None	.....	2.23
70⅜	72¼	62⅛	80¼	47¼	47¼	22¼	260,500	409,700	Intern. Nickel	No	14,584,025	1.30	.....	1.65
27	28¾	26¼	46½	32½	36¼	25	1,600	4,400	Intern. Salt	No	240,000	2.00	1.65	1.32
32¼	36	32¼	42⅜	27½	36¼	31	2,700	5,700	Kellogg (Spencer)	No	500,000	1.60	.....	.....
72	79	67¼	103	79	49¼	21½	24,200	79,300	Libbey Owens Ford	No	2,559,042	3.50	.....	3.26
49	52	43⅜	36½	26⅜	37¼	24½	7,400	38,500	Liquid Carbonic	No	342,406	1.60	.....	3.06
38⅛	41¾	38	171	155	33⅞	23¾	13,800	29,000	Mathieson Alkali	No	830,428	1.50	1.76	1.44
93	101	92¾	147	137¾	94¾	55	10,800	23,900	Monsanto Chem.	10	864,000	3.00	.....	3.84
36	37⅞	33¾	40	9	20⅝	14½	47,200	90,600	National Lead	10	3,098,310	.875	.....	1.08
167	171	167	164	125	162½	150	700	1,000	7% cum. "A" pfd.	100	243,676	7.00	.....	25.40
147	150	144	56	40¼	140½	121⅝	240	470	6% cum. "B" pfd.	100	103,277	6.00	.....	49.05
37¼	41¾	34¾	122½	115¾	10⅞	4⅜	144,700	344,700	Newport Industries	1	519,347	.60	.....	.57
165½	171¾	150	13	5⅜	129	80	7,600	11,000	Owens-Illinois Glass	25	1,330,602	6.00	7.53	6.52
62	65½	55½	146	84	53¼	42⅜	21,500	88,400	Procter & Gamble	No	6,410,000	1.87	.....	2.39
118½	118½	117	135	126	121	115	160	720	5% pfd. (ser. 2-1-29)	100	171,569	5.00	.....	94.14
14⅛	14⅜	11⅞	41⅜	25⅝	8¾	4	10,500	120,800	Tenn. Corp.	5	857,896	.15	.....	.22
41⅛	43	38¾	44¾	33	36¾	28¼	24,300	67,600	Texas Gulf Sulphur	No	2,540,000	2.50	.....	1.94
106	111	101½	105¼	71⅝	75¾	44	46,300	87,900	Union Carbide & Carbon	No	9,000,743	2.30	.....	3.06
82⅝	91	79	96¾	68	78	46	4,600	13,100	United Carbon	No	397,877	4.05	5.54	4.71
40¼	43⅝	37½	59	31¼	50⅝	35⅛	84,300	141,100	U. S. Indus. Alco.	No	391,033	1.00	.....	2.16
31⅛	34½	28¼	30½	16¼	21¾	11¼	119,100	243,400	Vanadium Corp.-Amer.	No	366,637	None	.....	—1.13
8¼	9½	7⅜	8½	4⅛	4⅝	2½	51,600	188,000	Virginia-Caro. Chem.	No	486,000	None	.....	2.56
55	61½	54⅛	58¾	28¾	35¾	17½	17,200	73,000	6% cum. part. pfd.	100	213,392	None	.....	.16
26	27¼	23½	32	19¾	25½	16¾	13,300	24,500	Westvaco Chlorine	No	284,962	.75	.....	1.63
33¾	34⅞	33	35¼	31¾			7,400	12,800	Westvaco Chlorine, cum. pfd.	30	192,000	1.50	.....	.....
NEW YORK CURB EXCHANGE														
32	35⅞	31⅞	40¾	29¼	30	15	70,600	125,000	Amer. Cyanamid "B"	No	2,404,194	1.00	.....	1.61
2⅜	2⅞	2⅛	3¾	2⅛	4	2	8,100	8,800	British Celanese Am. R.	10	2,806,000	None	.....	—.71%
113	113½	108½	116¼	99¼	115	90	2,050	2,525	Celanese, 7% cum. 1st pfd.	100	144,379	7.00	.....	21.96
13¾	13¾	10⅛	16½	9	15	7	2,900	5,800	Celluloid Corp.	15	194,952	None	.....	—.95
12⅞	14⅝	12⅞	15	11⅞	14½	11⅝	1,100	1,300	Courtaulds' Ltd.	1 £	24,000,000	7½%	.....	7.51%
149	159¼	135	142¼	94⅜	105½	80½	1,800	6,600	Dow Chemical	No	945,000	2.40	.....	4.42
8¾	10⅜	6¾	10¾	5	12½	6¼	4,700	33,800	Duval Texas Sulphur	No	500,000	.50	.....	.16
41	42⅛	39⅞	55	39	58	37	1,000	2,400	Heyden Chem. Corp.	10	147,600	2.25	.....	3.22
139¼	147½	125	140	98¼	97¼	46¾	4,800	15,700	Pittsburgh Plate Glass	25	2,141,305	6.00	.....	5.32
149	152	133	154½	117	128⅞	84	5,300	15,550	Sherwin Williams	25	635,583	4.00	8.04	6.19
110	114	110	11[illegible]	110	113½	106	90	490	5% pfd. cum.	100	155,521	5.00	41.44	33.17
PHILADELPHIA STOCK EXCHANGE														
169¼	175¾	162	179	114¼	116¾	76½	1,175	1,845	Pennsylvania Salt	50	150,000	8.50	10.59	7.74

Feb. Last	1937 High	1937 Low	1936 High	1936 Low	1935 High	1935 Low	Sales	Bonds	Date Due	Int. %	Int. Period	Out-standing $
NEW YORK STOCK EXCHANGE							Feb. 1937	1937				
109¼	109¼	108	117½	107¾	116	104½	459,000	1,087,000	Amer. I. G. Chem. Conv. 5½'s	1949	5½ M. N.	29,929,000
38	39	36½	42½	27½	29¾	7⅜	279,000	779,000	Anglo Chilean Nitrate inc. deb.	1967	4½-5	12,433,000
103¼	103¼	102⅛	102¾	92½	94½	77⅓	107,000	151,000	By-Products Coke Corp. 1st 5½'s "A"	1945	5½ M. N.	4,932,000
102	102	101¼	102¾	96¾	100¼	91⅛	41,000	59,000	Int. Agric. Corp. 1st Coll. tr. stpd. to 1942	1942	5 M. N.	5,994,100
41½	41½	37⅛	39	21	21½	7	298,000	853,000	Lautaro Nitrate conv. b's	1954	6 J. J.	31,357,000
23⅝	23⅝	22½	35	23½	38	32⅛	5,000	7,000	Ruhr Chem. 6's	1948	6 A. O.	3,156,000
104½	105	104½	105	103	104	91½	11,000	28,000	Tenn. Corp. deb. 6's "B"	1944	6 M. S.	3,007,900
104	108¼	98¼	98½	85¾	94¾	66	183,000	396,000	Vanadium Corp. conv. 5's	1941	5 A. A.	4,261,000

* Paid in 1936, including extras; ** For either fiscal or calendar years.

Industrial Trends

¶Business Activity Stages Recovery In Last Half Of February—Automotive, Steel Industries Advance Production Schedules—Retail Trade Up 14-22%; Wholesale Trade Up 18-22%—

Floods, the automotive strike, and the walk-out of shipping crews on the West Coast were the principal causes of the downward trend in business activity in the period between the middle of December through January. With these situations no longer a factor the upward movement has been resumed and activity is currently expanding at a very encouraging rate.

Automotive activity is almost back into full swing and steel plants are very busy. The threat of a major strike in the industry has been removed and tonnages already booked assure heavy production over the next few months. Close observers report that most lines of business are likely to record sharper increases during the next several weeks than have been reported since the turn of the year.

Steel mills are operating at 82½% of capacity, a rate not previously reached since 1929. With the General Motors strike over production in March is likely to climb to between 575,000 and 600,000 units, a gain of more than 30% over the like month of 1936. Particularly bright is the outlook for the textile, paper, rubber, glass and leather industries. The paint field is now swinging into heavy production schedules, anticipating the best year since 1929. Sharp increases in private building operations in most sections are expected to more than overcome the steady decline in public works projects. Rayon plants are operating at capacity and still cannot comfortably supply the demand. It will be several months before any substantial increase in productive capacity will become available. The fertilizer season is opening up encouragingly and producers not only anticipate a large volume but a fairly stable price structure.

Retail trade is ahead of the corresponding period of last year by 14 to 22%, while wholesale volume is up 18 to 22%. The extremely mild winter in most sections of the country has adversely affected a few lines, but an early Easter is helping to move spring merchandise rapidly.

Both car loadings and electrical production figures are running now substantially ahead of the corresponding periods of last month. Increases in car loadings over last year were particularly large in shipments of manufactured goods, less-than-carlot merchandise and ore, reflecting the upturn in industrial activity and in trade.

Wholesale prices moved higher in February. The index of wholesale commodity prices of the U. S. Dept. of Labor reached on Feb. 20th the highest point since June, 1930. Other recognized indices show slight appreciations for the February period. The non-ferrous metals, copper, lead, and zinc have had spectacular rises and in most quarters further advances are anticipated. Silk prices were much firmer last month and higher prices were reported for bituminous coal, petroleum and derivatives, and for building materials.

The Journal of Commerce business index crossed the 100 mark for the first time since the middle of December. The index of business activity of the *N. Y. Times* again turned upward last month and on Feb. 20th reached 104.8. This contrasts very favorably with 91.3 on Feb. 22, 1936.

Business entered the last month of the first quarter with the prospects much brighter than they were on Feb. 1st. Good old American humor has just about finished the dire threat of the latest fad, sit-down strikes, doing a pretty effective job after many of our law enforcement officers folded up under the pressure. At the moment the legislative picture in Washington is not very sharply discernible. Just what will become "must" legislation has not yet been made clear.

Chemical consumption is expanding rapidly now as the process industries expand operations. Generally the price structure is marked by exceptional firmness and most price changes are on the upward side. March is traditionally one of the best tonnage months and at the moment it would appear that the current 30-day period will see a record volume of tonnage shipped.

Industry's 1937 appropriations for research will exceed $250,000,000, it is estimated by Dr. E. R. Weidlein, president of the A. C. S., in announcing that 25 of more than 40 sessions arranged for the 93rd meeting of the Society at the University of North Carolina, April 12th to 15th, will be devoted to chemical investigations directly fostering industrial progress.

"With corporate earnings rising markedly and with the new tax law favoring legitimate expenditures in increased research, more and more attention is being given to the development of new products and new uses in the industries," declared Dr. Weidlein, who is director of Mellon Institute of Industrial Research, Pittsburgh.

Statistics of Business

	January 1937	January 1936	December 1936	December 1935	November 1936	November 1935
Automotive Production	379,843	364,004	498,721	404,528	394,890	395,059
Bldg. Contracts*‡	$242,844	$214,792	$199,695	$264,126	$208,204	$188,115
Failures, Dun & Bradstreet	811	1,077	692	910	688	893
Merchandise Imports‡	$240,396	$187,482	$239,835	$179,760	$196,423	$169,385
Merchandise Exports‡	$221,550	$198,564	$226,605	$220,931	$225,766	$269,838
Newsprint Production						
Canada, tons	.....	.....	.....	.....	285,771	262,854
U. S., tons	.....	.....	.....	.....	79,853	78,929
Newfoundland, tons	.....	.....	.....	.....	28,201	28,567
Plate Glass, prod., sq. ft.	.....	.....	7,371,236	16,112,218	13,083,963	15,909,262
Steel ingots production, tons	4,736,697	3,045,746	4,431,000	3,073,000	4,337,000	3,150,000
Pig iron production, tons	3,211,500	2,025,885	3,095,145	2,106,453	2,947,000	2,065,000
U. S. consumption, crude						
rubber, tons	48,744	48,506	49,626	42,942	50,303	42,310
Tire shipments	.....	.....	5,015,872	4,081,153	4,232,867	3,930,043
Tire production	.....	.....	5,311,007	4,051,286	4,971,838	3,997,025
Tire inventory	.....	.....	11,114,399	8,195,863	10,822,602	8,249,220
Dept. of Labor Indices†						
Factory payrolls, totals†	90.6	95.1	94 6	77.4	90.1	75.5
Factory employment†	96.4	86.8	97.7	88.2	96.6	88.7
Chemical employment†a	120.3	110.8	119.3	112.3	119.4	113.8
Chemical payrolls†a	118.9	98.8	118.0	101.1	113.4	100.4
Chemicals and Related Products						
Exports‡	.....	.....	$226	.....	.....	$10,465
Imports‡	.....	.....	.....	.....	.....	$6,685
Stocks, mfg. goods	.....	.....	.....	.....	120	118
Stocks, raw materials	.....	.....	.....	.....	110	111
Boot and shoe production	.....	.....	.....	.....	29,797,379	27,714,841

Week Ending	Carloadings 1937	Carloadings 1936	Carloadings % of Change	Electrical Output§ 1937	Electrical Output§ 1936	Electrical Output§ % of Change	Jour. of Com. Price Index	National Fertilizer Association Indices ‡‡Labor Dept. Chem. & Drugs	Fats & Oils	Fert. Mat.	Mixed Fert.	All Groups	Chem. & Drug Price Index	% Steel Activity	N. Y. Times Index Bus. Act.	Fisher's Index Pur. Power
Jan. 30	659,790	621,890	+ 6.1	.....	.....	.....	87.2	94.4	92 2	71.2	75.8	84.6	87.6	79.6	101.7	110.6
Feb. 6	675,026	621,686	+ 8.6	2,201,057	1,962,827	+12.1	88.4	95.3	89.6	71.0	75.8	85.9	87.2	80.6	101.2	110.6
Feb. 13	691,618	631,095	+ 9.6	2,199,860	1,952,476	+12.7	88.9	95.3	89.3	71.1	75.8	86.4	87.0	81.6	102.4	110.2
Feb. 20	714,884	586,487	+21.9	2,211,818	1,950,278	+13.4	88.8	95.3	88.1	71.1	76.7	85.9	87.7	82.5	104.8	109.9
Feb. 27	696,727	672,869	+ 3.5	2,207,285	1,941,633	+13.7	88.8	95.3	88.4	71.0	76.7	85.9	....	85.8	107.3	110.0

* 37 states; † Dept. of Labor, 3 year average, 1923-1925 = 100.0; ‡ 000 omitted; § K.W.H., 000 omitted; *a* Includes all allied products but not petroleum refining; ‡‡ 1926-1928 = 100.0; *y* Preliminary; *z* Revised.

Prices Current

Heavy Chemicals, Coal-tar Products, Dye-and-Tanstuffs, Colors and Pigments, Fillers and Sizes, Fertilizer and Insecticide Materials, Petroleum Solvents and Chemicals, Naval Stores, Fats and Oils, etc.

Chemical prices quoted are of American manufacturers for spot New York, immediate shipment, unless otherwise specified. Products sold f. o. b. works are specified as such. Import chemicals are so designated. Resale stocks when a market factor are quoted in addition to maker's prices and indicated "second hands."

Oils are quoted spot New York, ex-dock. Quotations f. o. b. mills, or for spot goods at the Pacific Coast are so designated.

Raw materials are quoted New York, f. o. b., or ex-dock. Materials sold f. o. b. works or delivered are so designated.

The current range is not "bid and asked," but are prices from different sellers, based on varying grades or quantities or both. Containers named are the original packages most commonly used.

Purchasing Power of the Dollar: 1926 Average—$1.00 - 1936 Average $1.18 - Jan. 1936 $1.19 - Feb. 1937 $1.10

	Current Market		1937 Low	1937 High	1936 Low	1936 High
Acetaldehyde, drs, c-l, wks lb.	...	.14	...	.14	...	.14
Acetaldol, 95%, 50 gal drs wks lb.	.21	.25	.21	.25	.21	.25
Acetamide, tech, lcl, kegs lb.	.32	.43	.32	.43	.38	.43
Acetanalid, tech, 150 lb bbls lb.	.24	.26	.24	.26	.24	.26
Acetic Anhydride, 100 lb cbys lb.	.20	.24	.20	.24	.21	.25
drs, f.o.b. wks, frt allowed lb.	.14	.15	.14	.15	...	.15
Acetin, tech, drs lb.	.22	.24	.22	.24	.22	.24
Acetone, tks, f.o.b. wks, frt allowed lb.	...	.06	...	.06	.06	.11
drs, c-l, f.o.b. wks, frt allowed lb.	...	.07	...	.07	.07	.12
Acetyl chloride, 100 lb cbys lb.	.55	.68	.55	.68	.55	.68
ACIDS						
Abietic, kgs, bbls lb.	.06¾	.07	.06¾	.07	.06¾	.07
Acetic, 28%, 400 lb bbls, c-l, wks 100 lbs.	...	2.25	2.25	2.45	...	2.45
glacial, bbls, c-l, wks 100 lbs.	...	8.00	8.00	8.43	...	8.43
glacial, USP, bbls, c-l, wks 100 lbs.	...	10.50	10.50	12.43	...	12.43
Adipic, kgs, bbls lb.	...	.72	...	.72	...	.72
Anthranilic, ref'd, bbls lb.	.85	.95	.85	.95	.85	.95
tech, bbls lb.	...	.75	...	.75	...	.75
Battery, cbys, delv 100 lbs.	1.35	2.50	1.35	2.50	1.35	2.50
Benzoic, tech, 100 lb kgs lb.	.43	.47	.43	.47	.40	.45
USP, 100 lb kgs lb.	.54	.59	.54	.59	.54	.59
Boric, tech, gran, 80 tons, bgs, delv ton *a*	...	95.00	...	95.00	...	95.00
Broenner's, bbls lb.	...	1.11	...	1.11	1.11	1.25
Butyric, edible, c-l, wks, cbys lb.	1.20	1.30	1.20	1.30	1.20	1.30
synthetic, c-l, drs lb.	...	.22	...	.22	...	.22
wks lb.	...	.23	...	.23	...	.23
tks, wks lb.	...	.21	...	.21	...	.21
Camphoric, drs lb.	5.50	5.70	5.50	5.70	...	5.25
Chicago, bbls lb.	...	2.10	...	2.10	...	2.10
Chlorosulfonic, 1500 lb drs, wks lb.	.03½	.05	.03½	.05	.03½	.05
Chromic, 99¾%, drs, delv lb.	.14¾	.16¾	.14¾	.16¾	.14¾	.16¾
Citric, USP, crys, 230 lb bbls lb. *b*	.25	.26	.25	.26	.25	.29
anhyd, gran, bbls lb. *b*	...	.29	...	.29	.29	.31
Cleve's, 250 lb bbls lb.	.50	.52	.50	.52	.50	.54
Cresylic, 99%, straw, HB, drs, wks, frt equal gal.	.72	.74	.72	.74	.51	.74
99%, straw, LB, drs, wks, frt equal gal.	.77	.79	.77	.79	.68	.79
resin grade, drs, wks, frt equal lb.	.09	.09½	.09	.09½	.52*y*	.65*y*
Crotonic, drs lb.	.90	1.00	.90	1.00	.90	1.00
Formic, tech, 140 lb drs lb.	.11	.13	.11	.13	.11	.13
Fumaric, bbls lb.	...	.60	...	.60	...	.60
Fuming, see Sulfuric (Oleum)						
Fuoric, tech, 90%, 100 lb. drs lb.	...	.35	...	.35	...	.35
Gallic, tech, bbls lb.	.65	.68	.65	.68	.65	.68
USP, bbls lb.	.77	.80	.77	.80	.70	.80
Gamma, 225 lb bbls, wks lb.	...	.85	...	.85	.80	.85
H, 225 lb bbls, wks lb.	.50	.55	.50	.55	.50	.55
Hydriodic, USP, 10% sol. cbys lb.	.50	.51	.50	.51	.50	.51
Hydrobromic, 48% com 155 lb cbys, wks lb.	.45	.48	.45	.48	.45	.48
Hydrochloric, see muriatic.						
Hydrocyanic, cyl, wks lb.	.80	1.30	.80	1.30	.80	1.30
Hydrofluoric, 30%, 400 lb bbls, wks lb.	.07	.07½	.07	.07½	.07	.07½
Hydrofluosilicic, 35%, 400 bbls, wks lb.	.10½	.15	.10½	.15	.11	.12
Lactic, 22%, dark, 500 lb bbls lb.	.02½	.02¾	.02½	.02¾	.02½	.05
22%, light ref'd, bbls lb.	.03½	.03¾	.03½	.03¾	.03½	.07
44%, light, 500 lb bbls lb.	.05½	.05¾	.05½	.05¾	.05½	.12
44%, dark, 500 lb bbls lb.	.06½	.06¾	.06½	.06¾	.06½	.10
50%, water white, 500 lb bbls lb.	.10½	.11½	.10½	.11½	.10½	.14½
USP X, 85%, cbys lb.	.45	.50	.45	.50	.45	.50
Laurent's, 250 lb bbls lb.	.45	.46	.45	.46	.45	.47
Linoleic, bbls lb.	...	.16	.16	.16	.16	.16
Maleic, powd, kgs lb.	.29	.32	.29	.32	.29	.32
Malic, powd, kgs lb.	.45	.60	.45	.60	.45	.60
Metanillic, 250 lb bbls lb.	.60	.65	.60	.65	.60	.65
Mixed, tks, wks N unit	.06½	.07¼	.06½	.07¼	.06½	.07¼
S unit	.008	.009	.008	.009	.008	.009
Monochloracetic, tech, bbls lb.	.16	.18	.16	.18	.16	.18
Monosulfonic, bbls lb.	1.50	1.60	1.50	1.60	1.50	1.60
Muriatic, 18°, 120 lb cbys, c-l, wks 100 lb.	...	1.35	...	1.35	...	1.35
tks, wks 100 lb.	...	1.00	...	1.00	...	1.00
20°, cbys, c-l, wks 100 lb.	...	1.45	...	1.45	...	1.45
tks, wks 100 lb.	...	1.10	...	1.10	1.10	1.20
22°, c-l, cbys, wks 100 lb.	...	1.95	...	1.95	...	1.95
tks, wks 100 lb.	...	1.60	...	1.60	...	1.60
CP, cbys lb.	.06½	.07½	.06½	.07½	.06½	.07½
N & W, 250 lb bbls lb.	.85	.87	.85	.87	.85	.87
Naphthenic, 240-280 s.v., drs lb.	.11	.14	.11	.14	.11	.14
Sludges, drs lb.	.06	.10	.06	.10	.06	.10
Naphthionic, tech, 250 lb bbls lb.	.60	.65	.60	.65	.60	.65
Nitric, 36°, 135 lb cbys, c-l, wks 100 lb. *c*	...	5.00	...	5.00	...	5.00
38°, c-l, cbys, wks 100 lb. *c*	...	5.50	...	5.50	...	5.50
40°, cbys, c-l, wks 100 lb. *c*	...	6.00	...	6.00	...	6.00
42°, c-l, cbys, wks 100 lb. *c*	...	6.50	...	6.50	...	6.50
CP, cbys, delv lb.	.11½	.12½	.11½	.12½	.11½	.12½
Oxalic, 300 lb bbls, wks, or N. Y. lb.	.10¾	.12	.10¾	.12	.10¾	.12½
Phosphoric, 50%, USP, cbys lb.	.14	.14	.14	.14	.14	.14
50%, acid, c-l, drs, wks lb.	.06	.08	.06	.08	.06	.08
75%, acid, c-l, drs, wks lb.	.09	.10½	.09	.10½	.09	.10½
Picramic, 300 lb bbls, wks lb.	.65	.70	.65	.70	.65	.70
Picric, kgs, wks lb.	.30	.40	.30	.40	.30	.40
Propionic, 98% wks, drs lb.	...	.22	...	.22	...	.35
80% lb.	.16	.17½	.16	.17½	.15	.17½
Pyrogallic, crys, kgs, wks lb.	1.55	1.65	1.55	1.65	1.55	1.65
Salicylic, tech, 125 lb bbls, wks lb.	...	.33	...	.33	...	.40
Sebacic, tech, drs, wks lb.	...	.58	...	.58	...	.58
Succinic, bbls lb.	...	.75	...	.75	...	.75
Sulfanilic, 250 lb bbls, wks lb.	.17	.18	.17	.18	.17	.19
Sulfuric, 60°, tks, wks ton	...	12.00	...	12.00	11.00	12.00
c-l, cbys, wks 100 lb.	...	1.10	...	1.10	...	1.10
66°, tks, wks ton	...	15.50	...	15.50	...	15.50
c-l, cbys, wks 100 lb.	...	1.35	...	1.35	...	1.35
CP, cbys, wks lb.	.06½	.07½	.06½	.07½	.06½	.07½
Fuming (Oleum) 20% tks, wks ton	...	18.50	...	18.50	...	18.50
Tannic, tech, 300 lb bbls. lb	.19	.36	.19	.36	.19	.40
Tartaric, USP, gran, powd, 300 lb bbls lb.	...	.21¾	...	.21¾	.22¾	.24
Tobias, 250 lb bbls lb.	.65	.67	.65	.67	.65	.72½
Trichloroacetic bottles lb.	2.00	2.50	2.00	2.50	2.45	2.75
kgs lb.	...	1.75	...	1.75	...	1.75
Tungstic, tech, bbls lb.	1.50	1.60	1.50	1.60	1.50	1.60
Vanadic, drs, wks lb.	1.10	1.20	1.10	1.20	1.10	1.20
Albumen, light flake, 225 lb bbls lb.	.50	.60	.50	.60	.50	.60
dark, bbls lb.	.12	.17	.12	.17	.12	.17
egg, edible lb.	.78	.79	.78	.79	.77	1.05
vegetable, edible lb.	.65	nom.	...	nom.	.65	.70
ALCOHOLS						
Alcohol, Amyl (from Pentane) tks, delv lb.	...	.123	...	.123	.123	.143
c-l, drs, delv lb.	...	.133	...	.133	.133	.150
lcl, drs, delv lb.	...	.143	...	.143	.143	.157
Amyl, secondary, tks, delv lb.	...	.08½	...	.08½	.08½	.108
Benzyl, bottles lb.	.65	1.10	.65	1.10	.65	1.10
Butyl, normal, tks, f.o.b. wks, frt allowed lb. *d*	...	.09	.08½	.09	.08½	.11
c-l, drs, f.o.b. wks, frt allowed lb. *d*	...	.10	.09½	.10	.09½	.12
Butyl, secondary, tks, delv lb. *d*	...	.07	...	.07	.07	.096
c-l, drs, delv lb. *d*	...	.08	...	.08	.08	.106
Capryl, drs, tech, wks lb.	...	.85	...	.85	...	.85
Cinnamic, bottles lb.	2.50	3.65	2.50	3.65	2.50	3.65
Denatured, CD, No. 11, 12, 13, c-l, drs, wks gal. *e*	...	.33	...	.33	.30	.44*
Western schedule, c-l, wks gal. *e*	...	.39	...	.39	.39	.52*
Denatured, SD, No. 1, tks	...	.26	...	.26	.23	.28
c-l, drs, wks gal. *e*	...	.29	...	.29	.29	.34
Diacetone, tech, tks, delv lb. *f*	...	.11½	...	.11½	...	.16
c-l, drs, delv lb. *f*	...	.12½	...	.12½	...	.17

a Powdered boric acid $5 a ton higher in each case; USP $15 higher; *b* Powdered citric is ½c higher; kegs are in each case ½c higher than bbls. *y* Price given is per gal.

c Yellow grades 25c per 100 lbs. less in each case; *d* Spot prices are 1c higher; *e* Anhydrous is 5c higher in each case; *f* Pure prices are 1c higher in each case; * Dealers were given 20% off this price.

ABBREVIATIONS—Anhydrous, anhyd; bags, bgs; barrels, bbls; carboys, cbys; carlots, c-l; less-than-carlots, lcl; drums, drs; kegs, kgs; powdered, powd; refined, ref'd; tanks, tks; works, f.o.b., wks.

		Current Market	1937 Low	1937 High	1936 Low	1936 High
Alcohols (continued)						
Ethyl, 190 proof, molasses, tks	gal. *g*	...	4.07	...	4.07	4.07	4.10
c-l, drs	gal. *g*	...	4.11	...	4.11	4.11	4.27
c-l, bbls	gal. *g*	...	4.12	...	4.12	4.12	4.28
absolute, drs	gal. *g*	4.54	6.08½	4.54	6.08½	4.54	6.11½
Furfuryl, tech, 500 lb drs	lb.	...	.35	...	.35	...	.35
Hexyl, secondary tks, delv	lb.	...	.11½	...	.11½	...	.11½
c-l, drs, delv	lb.	...	.12½	...	.12½	...	.12½
Normal, drs, wks	lb.	3.25	3.50	3.25	3.50	3.25	3.50
Isoamyl, prim, cans, wks	lb.	...	.32	...	.32	...	.32
drs, lcl, delvd	lb.	...	.27	...	.27	...	.27
Isobutyl, ref'd, lcl, drs	lb.	...	.10	...	.10	.10	.12
c-l, drs	lb.	...	.09½	...	.09½	.09½	.11½
tks	lb.	...	.08½	...	.08½	.08½	.10½
Isopropyl, refd, c-l, drs, f.o.b. wks, frt allowed	lb.	...	.45	...	.45	.45	.55
Propyl, norm, 50 gal drs	gal.	...	.75	...	.75	...	.75
Special Solvent, tks, wks	gal.	...	.27	...	.27	.24	.32
Aldehyde ammonia, 100 gal drs	lb.	.80	.82	.80	.82	.80	.82
Alphanaphthol, crude, 300 lb bbls	lb.	..	.52	...	.52	.52	.65
Alphanaphthylamine, 350 lb bbls	lb.	.32	.34	.32	.34	.32	.34
Alum, ammonia, lump, c-l, bbls, wks	100 lb.	...	3.00	...	3.00	...	3.00
25 bbls or more, wks	100 lb.	..	3.15	...	3.15	...	3.15
less than 25 bbls, wks	100 lb.	...	3.25	...	3.25	...	3.25
Granular, c-l, bbls. wks	100 lb.	...	2.75	...	2.75	...	2.75
25 bbls or more, wks	100 lb.	...	2.90	...	2.90	...	2.90
Powd, c-l, bbls, wks	100 lb.	...	3.15	...	3.15	...	3.15
25 bbls or more, wks	100 lb.	...	3.30	...	3.30	...	3.30
Chrome, bbls	100 lb.	7.00	7.25	7.00	7.25	7.00	7.25
Potash, lump, c-l, bbls, wks	100 lb.	...	3.25	...	3.25	...	3.25
25 bbls or more, wks	100 lb.	...	3.40	...	3.40	...	3.40
Granular, c-l, bbls, wks	100 lb.	...	3.40	...	3.40	...	3.40
25 bbls or more, bbls, wks	100 lb.	...	3.00	...	3.00	...	3.00
Powd, c-l, bbls, wks	100 lb.	...	3.40	...	3.40	...	3.40
25 bbls or more, wks	100 lb.	...	3.55	...	3.55	...	3.55
Soda, bbls, wks	100 lb.	4.00	4.15	4.00	4.15	4.00	4.15
Aluminum metal, c-l, NY	100 lb.	...	20.00	19.00	20.00	19.00	20.00
Acetate, CP, 20%, bbls	lb.	.09	.10	.09	.10	.09	.10
Chloride anhyd, 99%, wks	lb.	.07	.12	.07	.12	.07	.12
93%, wks	lb.	.05	.08	.05	.08	.05	.08
Crystals, c-l, drs, wks	lb.	.06	.06¼	.06	.06¼	.06	.07
Solution, drs, wks	lb.	.02¾	.03¼	.02¾	.03¼	.02¾	.03½
Hydrate, 96%, light, 90 lb bbls, delv	lb.	.13	.15	.13	.15	.13	.15
heavy, bbls, wks	lb.	.029	.03½	.029	.03½	.029	.04½
Oleate, drs	lb.	.16¾	.18½	.16¾	.18½	.15¾	.18½
Palmitate, bbls	lb.	.22	.23	.22	.23	.21	.22
Resinate, pp., bbls	lb.	...	.15	...	.15	...	.15
Stearate, 100 lb bbls	lb.	.19	.21	.19	.21	.18	.21
Sulfate, com, c-l, bgs, wks	100 lb.	...	1.35	...	1.35	...	1.35
c-l, bbls, wks	100 lb.	...	1.55	...	1.55	...	1.55
Sulfate, iron-free, c-l, bgs, wks	100 lb.	...	1.90	...	1.90	...	1.90
c-l, bbls, wks	100 lb.	...	2.05	...	2.05	...	2.05
Aminoazobenzene, 110 lb kgs	lb.	...	1.15	...	1.15	...	1.15
Ammonia anhyd com, tks	lb.	.04½	.05½	.04½	.05½	.04½	.05½
Ammonia anhyd, 100 lb cyl	lb.	.16	.22	.16	.22	.15¼	.22
26°, 800 lb drs, delv	lb.	.02¼	.02½	.02¼	.02½	.02¼	.03
Aqua 26°, tks, NH	cont.	...	.04½	...	.04½	.04½	.05
tk wagon	lb.	...	.02	...	.02	.02	.024
Ammonium Acetate, kgs	lb.	.26	.33	.26	.33	.26	.33
Bicarbonate, bbls, f.o.b. wks	100 lb.	5.15	5.71	5.15	5.71	5.15	5.71
Bifluoride, 300 lb bbls	lb.	.16	.17	.16	.17	.15	.17
carbonate, tech, 500 lb bbls	lb.	.08	.12	.08	.12	.08	.12
Chloride, White, 100 lb bbls, wks	100 lb.	4.45	4.90	4.45	4.90	4.45	4.90
Gray, 250 lb bbls, wks	100 lb.	5.00	5.75	5.00	5.75	5.00	5.75
Lump, 500 lbs cks spot	lb.	.10½	.11	.10½	.11	.10½	.11
Lactate, 500 lb bbls	lb.	.15	.16	.15	.16	.15	.16
Linoleate	lb.	.11	.12	.11	.12	.11	.12
Nitrate, tech, cks	lb.	.04	nom.	.04	nom.	.04	.05
Oleate, drs	lb.	...	.10	...	.10	...	.10
Oxalate, neut, cryst, powd, bbls	lb.	...	.23	...	.23	.26	.27
pure, cryst, bbls, kgs	lb.	.27	.28	.27	.28	.27	.28
Perchlorate, kgs	lb.	...	.16	...	.16	...	.16
Persulfate, 112 lb kgs	lb.	.21	.24	.21	.24	.21	.25
Phosphate, dibasic tech, powd, 325 lb bbls	lb.	.07½	.10	.07½	.10	.07½	.10
Sulfate, dom, f.o.b., bulk	ton	...	27.00	26.00	27.00	22.00	26.00
200 lb bgs	ton	...	nom.	...	nom.	...	nom.
100 lb bgs	lb.	...	nom.	...	nom.	...	nom.
Sulfocyanide, kgs	lb.	...	.55	...	.55	...	.55
Amyl Acetate (from pentane) tks, delv	lb.	...	.11½	...	.11½	.11½	.13½
tech, drs, delv	lb.	.11½	.12	.11½	.13½	.12½	.149
Secondary, tks, delv	lb.	...	.08½	...	.08½	...	.108
c-l, drs, delv	lb.	...	.09½	...	.09½	.118	.123
Chloride, norm, drs, wks	lb.	.56	.68	.56	.68	.56	.68
mixed, drs, wks	lb.	.07	.077	.07	.077	.07	.077
tks, wks	lb.	...	.06	...	.06	...	.06
Mercaptan, drs, wks	lb.	...	1.10	...	1.10	...	1.10
Oleate, lcl, wks, drs	lb.	...	.25	...	.25	...	...
Stearate, lcl, wks, drs	lb.	...	.26	...	.26	...	...

g Grain alcohol 20c a gal. higher in each case.

		Current Market	1937 Low	1937 High	1936 Low	1936 High
Amylene, drs, wks	lb.	.102	.11	.102	.11	.102	.11
tks, wks	lb.	...	.09	...	.09	...	.09
Aniline Oil, 960 lb drs and tks	lb.	.15	.17½	.15	.17½	.15	.17½
Annatto fine	lb.	.34	.37	.34	.37	.34	.37
Anthracene, 80%	lb.	...	.75	...	.75	...	.75
40%	lb.	...	.18	...	.18	...	.18
Anthraquinone, sublimed, 125 lb bbls	lb.	...	.65	.50	.65	.50	.52
Antimony metal slabs, ton lots	lb.	.15½	.15¾	.13⅝	.15¾	.11⅜	.14
Butter of, see Chloride.							
Chloride, soln cbys	lb.	...	.17	...	.17	.13	.17
Needle, powd, bbls	lb.	.14	.16	.14	.16	.11	.12½
Oxide, 500 lb bbls	lb.	.15¾	.15½	.14¾	.15½	.12¾	.14
Salt, 63% to 65%, tins	lb.	.22	.24	.22	.24	.22	.24
Sulfuret, golden, bbls	lb.	.22	.23	.22	.23	.22	.23
Vermilion, bbls	lb.	.35	.42	.35	.42	.35	.42
Archil, conc, 600 lb bbls	lb.	.21	.27	.21	.27	.21	.27
Double, 600 lb bbls	lb.	.18	.20	.18	.20	.18	.20
Argols, 80%, casks	lb.	.14	.15	.14	.15	.14	.15
Crude, 30%, casks	lb.	.07	.08	.07	.08	.07	.08
Aroclors, wks	lb.	.18	.30	.18	.30	.18	.30
Arrowroot, bbl	lb.	.08¾	.09¾	.08¾	.09¾	.08¾	.09¾
Arsenic, Metal	lb.	.42	.44	.42	.44	.40	.44
Red, 224 lb cs kgs	lb.	...	.15¾	...	.15¾	...	.15¾
White, 112 lb kgs	lb.	.03	.04	.03	.04	.03	.04½
Asbestine, c-l, wks	ton	13.00	15.00	13.00	15.00	13.00	15.00
Barium Carbonate precip, 200 lb bgs, wks	ton	52.50	62.50	52.50	62.50	56.50	61.00
Nat (witherite) 90% gr, c-l, wks, bgs	ton	42.00	45.00	42.00	45.00	42.00	45.00
Chlorate, 112 lb kgs NY	lb.	.16½	.17½	.16½	.17½	.15½	.17½
Chloride, 600 lb bbl, wks	ton	72.00	74.00	72.00	74.00	72.00	74.00
Dioxide, 88%, 690 lb drs	lb.	.11	.12	.11	.12	.11	.12
Hydrate, 500 lb bbls	lb.	.04¾	.05½	.04¾	.05½	.05¼	.06
Nitrate, bbls	lb.	...	.07	...	.07	.07	.08¼
Barytes, floated, 350 lb bbls wks	ton	23.65	31.15	23.65	31.15	23.65	31.15
Bauxite, bulk, mines	ton	7.00	10.00	7.00	10.00	7.00	10.00
Bentonite, c-l, No. 1, bgs, wks	ton	...	16.00	...	16.00	...	16.50
No. 2	ton	...	11.00	...	11.00	...	11.00
Benzaldehyde, tech, 945 lb drs, wks	lb.	.60	.62	.60	.62	.60	.62
Benzene (Benzol), 90%, Ind, 8000 gal tks, frt allowed	gal.	...	.16	...	.16	.16	.18
90% c-l, drs	gal.	...	.23	...	.23	...	.23
Ind pure, tks, frt allowed	gal.	...	.16	...	.16	.16	.18
Benzidine Base, dry, 250 lb bbls	lb.	.70	.72	.70	.72	.70	.74
Benzoyl Chloride, 500 lb drs	lb.	.40	.45	.40	.45	.40	.45
Benzyl Chloride, tech, drs	lb.	.30	.40	.30	.40	.30	.40
Beta-Naphthol, 250 lb bbl, wks	lb.	.23	.24	.23	.24	.24	.27
Naphthylamine, sublimed, 200 lb bbls	lb.	1.25	1.35	1.25	1.35	1.25	1.35
Tech, 200 lb bbls	lb.	.51	.52	.51	.52	.51	.55
Bismuth metal	lb.	1.00	1.10	1.00	1.10	1.00	1.10
Chloride, boxes	lb.	3.20	3.25	3.20	3.25	3.20	3.25
Hydroxide, boxes	lb.	3.15	3.20	3.15	3.20	3.15	3.20
Oxychloride, boxes	lb.	2.75	3.00	2.75	3.00	2.95	3.00
Subbenzoate, boxes	lb.	3.25	3.30	3.25	3.30	3.25	3.30
Subcarbonate, kgs	lb.	1.40	1.45	1.40	1.45	1.40	1.45
Trioxide, powd, boxes	lb.	3.45	3.50	3.45	3.50	3.45	3.50
Subnitrate	lb.	1.30	1.35	1.30	1.35	1.30	1.35
Blackstrap, cane (see Molasses, Blackstrap).							
Blanc Fixe, 400 lb bbls, wks	ton *h*	40.00	75.00	40.00	75.00	42.50	70.00
Bleaching Powder, 800 lb drs, c-l, wks, contract	100 lb.	...	2.00	...	2.00	...	2.00
lcl, drs, wks	lb.	2.25	3.60	2.25	3.60	2.25	3.60
Blood, dried, f.o.b., NY	unit	...	3.90	3.90	4.30	2.50	4.25
Chicago, high grade	unit	...	3.90	3.90	4.65	2.90	4.50
Imported shipt	unit	...	3.90	3.90	4.10	2.60	3.75
Blues, Bronze Chinese Milori	lb.	.36	.37	.36	.37	.37	.38½
Prussian Soluble	lb.	.36	.37	.36	.37	.37	.38½
Ultramarine,* dry, wks, bbls	lb.	...	.10	...	.10	...	.10
Regular grade, group 1	lb.	...	.15	...	.15	...	.15
Special, group 1	lb.	...	.18	...	.18	...	.18
Pulp, No. 1	lb.	...	.26	...	.26	...	.26
Bone, 4½ + 50% raw, Chicago	ton	...	28.00	26.00	28.00	20.00	25.00
Bone Ash, 100 lb bgs	lb.	.06	.07	.06	.07	.06	.07
Black, 200 lb bbls	lb.	.05½	.08¼	.05½	.08¼	.05½	.08¼
Meal, 3% & 50%, imp	ton	...	26.25	25.00	26.25	23.00	26.00
Domestic, bgs, Chicago	ton	...	23.00	19.00	23.00	16.00	20.00
Borax, tech, gran, 80 ton lots, sacks, delv	ton *i*	...	40.00	...	40.00	...	40.00
bbls, delv	ton *i*	...	50.00	...	50.00	...	50.00
c-l, sacks, delv	ton *i*	...	44.00	...	44.00	...	44.00
c-l, bbls, delv	ton *i*	...	54.00	...	54.00	...	54.00
Tech, powd, 80 ton lots, sacks	ton *i*	...	45.00	...	45.00	...	45.00
bbls, delv	ton *i*	...	56.00	...	56.00	...	56.00
c-l, sacks, delv	ton *i*	...	49.00	...	49.00	...	49.00
c-l, bbls, delv	ton *i*	...	59.00	...	59.00	...	59.00
Bordeaux Mixture, consumers, East, c-l, tins, drs, cases	lb.	.10½	.11	.10½	.11	.08	.16
Dealers, East, c-l	lb.	.10	.10½	.10	.10½	.08½	.16½

h Lowest price is for pulp, highest for high grade precipitated; *i* Crystals $6 per ton higher; USP, $15 higher in each case; * Freight is equalized in each case with nearest producing point.

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C. P. CHEMICALS AND ACIDS

Bromine
Chromium Fluoride

Prices

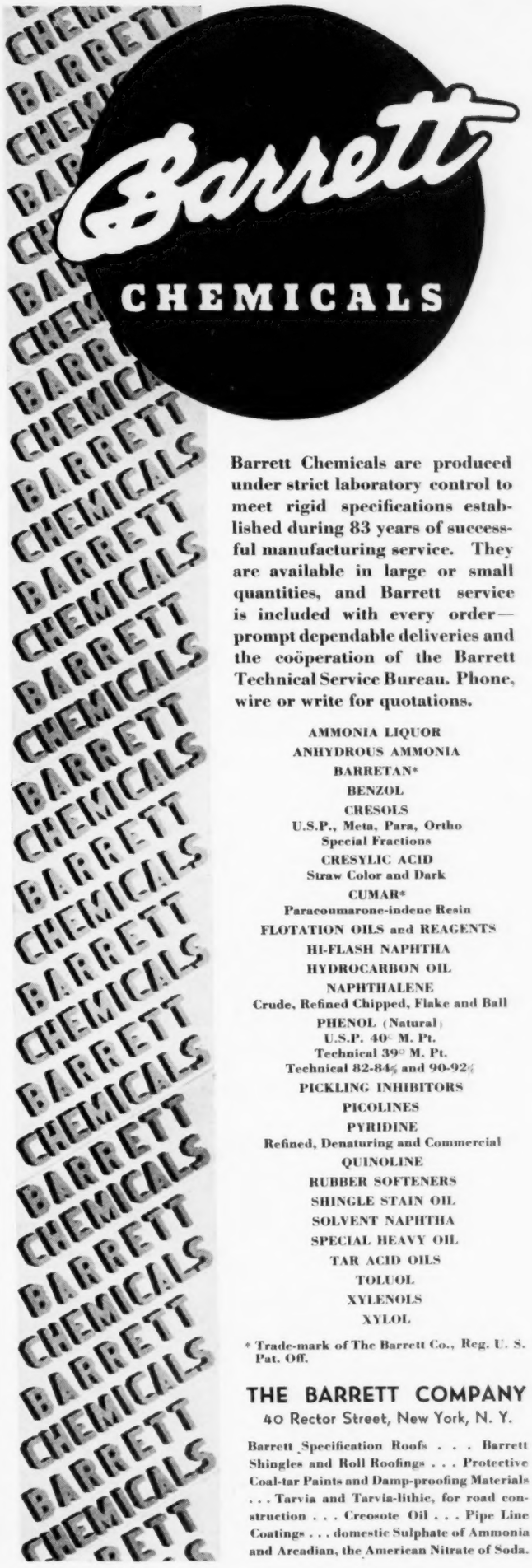
	Current Market	1937 Low	1937 High	1936 Low	1936 High
Bromine, cases ..... lb.	.30	.30	.43	.30	.43
Bronze, Al, pwd, 300 lb drs lb.	.80	.80	1.50	.80	1.50
Gold, blk ..... lb.	.40	.40	.55	.40	.55
Butanes, com 16-32° group 3 tks ..... lb.	.02¼	.02¼	.03¾	...	.04
Butyl, Acetate, norm drs, frt allowed ..... lb.	.10	.10	.10½	.09½	.12½
tks, frt allowed ..... lb.	...	...	.09	.08½	.11
Secondary, tks, frt allowed ..... lb.	...	...	.07½	.07½	.096
drs, frt, allowed ..... lb.	.08½	.08½	.09	.106	.111
Aldehyde, 50 gal drs, wks ..... lb.	.16½	.16½	.17½	.19	.21
Carbinol, norm drs, wks lb.	.60	.60	.75	.60	.75
Lactate ..... lb.	.22½	.22½	.23½	.22½	.23½
Oleate, drs, frt allowed .. lb.	...	...	.25	...	...
Propionate, drs ..... lb.	.18	.18	.18½	.18	.18½
tks, delv ..... lb.	...	...	.17	...	.17
Stearate, 50 gal drs .... lb.	...	...	.25	...	.26
Tartrate, drs ..... lb.	.55	.55	.60	.55	.60
Butyraldehyde, drs, lcl, wks lb.	...	...	.35½	...	...
Cadmium Metal ..... lb.	...	1.05	...	1.05	.75 1.05
Sulfide, boxes ..... lb.	.90	.90	1.00	.90	1.10
Calcium, Acetate, 150 lb bgs c-l, delv ..... 100 lb.	...	...	2.10	...	2.10
Arsenate, jobbers, East of Rocky Mts, drs ..... lb.	.06	.06	.06¾	.06	.06¾
dealers, drs ..... lb.	.06¼	.06¼	.07¾	.06¼	.07¾
South, jobbers, drs ... lb.	.06	.06	.06½	.06	.06½
dealers, drs ..... lb.	.06½	.06½	.06¾	.06½	.06¾
Carbide, drs ..... lb.	.05	.05	.06	.05	.06
Carbonate, tech, 100 lb bgs c-l ..... lb.	1.00	1.00	1.00	1.00	1.00 1.00
Chloride, flake, 375 lb drs, c-l, delv ..... ton	...	...	22.00	...	22.00
Solid, 650 lb drs, c-l, delv ..... ton	...	...	20.00	...	20.00
Ferrocyanide, 350 lb bbls wks ..... lb.	...	...	.17	...	.17
Gluconate, Pharm, 125 lb bbls ..... lb.	.50	.50	.57	.50	.57
Nitrate, 100 lb bgs .... ton	.	.	26.10	.	26.50
Palmitate, bbls ..... lb.	.22	.22	.23	.21	.22
Phosphate, tech, 450 lb bbls ..... lb.	.06½	.06½	.07½	.07½	.08
Resinate, precip, bbls ... lb.	.13	.13	.14	.13	.14
Stearate, 100 lb bbls ... lb.	.19	.18	.21	.18	.21
Camphor, slabs ..... lb.	...	...	.55	.50	.56
Powder ..... lb.	...	...	.55	.4940	.56
Camwood, Bk, ground bbls lb.	.16	.16	.18	.16	.18
Carbon Bisulfide, 500 lb drs lb.	.05	.05	.05¾	.05¼	.08
Black, c-l, bgs, delv, price varying with zone ... lb.	.0445	.0445	.0535	.0445	.0535
lcl, bgs, delv, all zones lb.	...	...	.07	...	.07
cartons, delv ..... lb.	...	...	.07¾	...	.07¾
cases, delv ..... lb.	.	.	.08¼	.	.08¼
Decolorizing, drs, c-l ... lb.	.08	.08	.15	.08	.15
Dioxide, Liq 20-25 lb cyl lb.	.06	.06	.08	.06	.08
Tetrachloride, 1400 lb drs, delv ..... lb.	.05¼	.05¼	.06	.05¼	.06
Casein, Standard, Dom, grd lb.	.18¾	.18¾	.20¾	.14½	.20¾
80-100 mesh, c-l, bgs ... lb.	...	.19¼	.19¼	.21¼	.15 .21¼
Castor Pomace, 5½ NH_3, c-l, bgs, wks ..... ton	...	...	23.00	...	23.00 15.00 20.00
Imported, ship, bgs .... ton	...	...	nom.	...	nom. 17.00 18.00
Celluloid, Scraps, ivory cs lb.	.12	.12	.15	.12	.15 .17 .18
Transparent, cs ..... lb.	.12	.12	.13	.12	.13 ... .20
Cellulose, Acetate, 50 lb kgs ..... lb.	...	.40	.40	.55	.55 .60
Chalk, dropped, 175 lb bbls lb.	.03	.03	.03¾	.03	.03¾
Precip, heavy, 560 lb cks lb.	.03	.03	.04	.03	.03 .04
Light, 250 lb cks ..... lb.	.03	.03	.04	.03	.04 .04
Charcoal, Hardwood, lump, blk, wks ..... bu.	...	...	.15	...	.15 .15
Softwood, bgs, delv* .... ton	27.00	27.00	30.40	27.00	30.40 24.40 30.40
Willow, powd, 100 lb bbl, wks ..... lb.	.06	.06	.06¼	.06	.06¼ .06 .06¼
Chestnut, clarified bbls, wks lb.	...	...	.01625	...	.01625 .01625 .01⅞
25%, tks, wks ..... lb.	...	...	.02	...	.02 .01½ .02
Pwd, 60%, 100 lb bgs, wks ..... lb.	...	...	.04⅞	...	.04⅞ ... .04⅞
China Clay, c-l, blk mines ton	...	...	6.50	...	6.50 7.00
Imported, lump, blk ... ton	22.00	22.00	25.00	22.00	25.00 15.00 25 00
Chlorine, cyls, lcl, wks, contract ..... lb.	.07½	.07½	.08½	.07½	.08½ .07½ .08½
cyls, c-l, contract ... lb. *j*	...	...	.05½	...	.05½ ... .05½
Liq, tk, wks, contract 100 lb.	...	...	2.15	...	2.15 ... 2.15
Multi, c-l, cyls, wks, cont ..... lb.	2.30	2.30	2.55	2.30	2.55 2.30 2.55
Chloroacetophenone, tins, wks ..... lb.	3.00	3.00	3.50	3.00	3.50 ... 3.00
Chlorobenzene, Mono, 100 lb drs, lcl, wks ..... lb.	.06	.06	.07½	.06	.07½ .06 .07½
Chloroform, tech, 1000 lb drs ..... lb.	.20	.20	.21	.20	.21 .20 .21
USP, 25 lb tins ..... lb.	.30	.30	.31	.30	.31 .30 .31
Chloropicrin; comml cyls . lb.	.	.	.80	.	.80 .85 .90
Chrome, Green, CP ..... lb.	.20	.20	.23	.20	.23 .21½ .23
Yellow ..... lb.	.13	.13	.14	.13	.14 .11 .14
Chromium, Acetate, 8% Chrome, bbls ..... lb.	.05	.05	.08	.05	.08 .06 .08
20° soln, 400 lb bbls ... lb.	...	...	.05½	...	.05½ ... .05½
Fluoride, powd, 400 lb bbl ..... lb.	.27	.27	.28	.27	.28 .27 .28

j A delivered price; * Depends upon point of delivery.

Current

		Current Market		1937 Low	1937 High	1936 Low	1936 High
Coal tar, bbls	bbl.	7.25	9.00	7.25	9.00	7.25	9.00
Cobalt Acetate, bbls	lb.	.58	.60	.58	.60	.58	.60
Carbonate tech, bbls	lb.	1.42¾	1.48	1.42¾	1.48	1.35	1.48
Hydrate, bbls	lb.	1.66	1.76	1.66	1.76	1.66	1.76
Linoleate, paste, bbls	lb.	...	.31¼	...	.31¼	.30	.31¼
Oxide, black, bgs	lb.	1.41	1.51	1.41	1.51	1.29	1.49
Resinate, fused, bbls	lb.	...	.13	...	.13	.12½	.13
Precipitated, bbls	lb.	...	.30½	...	.30½	.	.32
Cochineal, gray or bk bgs	lb.	.32	.36	.32	.36	.32	.36
Teneriffe silver, bgs	lb.	.33	.37	.33	.37	.33	.37
Copper, metal, electrol 100 lb		...	15.00	13.00	15.00	9.50	12.00
Carbonate, 400 lb bbls	lb.	.11½	.12½	.11½	.12½	.	.08¼
52-54% bbls	lb.	.17¼	.17½	.16¼	.17½	.14½	.16¼
Chloride, 250 lb bbls	lb.	.17	.18	.17	.18	.17	.18
Cyanide, 100 lb drs	lb.	.37	.38	.37	.38	.37	.38
Oleate, precip, bbls	lb.	...	.20	.	.20	.	.20
Oxide, black, bbls, wks	lb.	...	nom.	.17½	.18	.14½	.15¾
red 100 lb bbls	lb.	.17	.18	.17	.18	.14	.15
Resinate, precip, bbls	lb.	.18	.19	.18	.19	.18	.19
Stearate, precip, bbls	lb.	.35	.40	.35	.40	.35	.40
Sub-acetate verdigris, 400 lb bbls	lb.	.18	.19	.18	.19	.18	.19
Sulfate, bbls, c-l, wks 100 lb.		...	5.35	4.55	5.35	3.85	4.55
Copperas, crys and sugar bulk c-l, wks	ton	12.00	13.00	12.00	13.00	13.00	16.00
Corn Sugar, tanners, bbls 100 lb.		3.74	3.84	3.74	3.84	3.08	4.03
Corn Syrup, 42°, bbls 100 lb.		...	3.76	3.76	3.80	3.05	3.95
43°, bbls 100 lb.		...	3.86	3.86	3.88	3.10	4.05
Cotton, Soluble, wet, 100 lb bbls	lb.	.40	.42	.40	.42	.40	.42
Cream Tartar, USP, powd & gran, 300 lb bbls	lb.	...	.15	...	.15	.15	.16¾
Creosote, USP, 42 lb cbys	lb.	.45	.47	.45	.47	.45	.47
Oil, Grade 1, tks	gal.	.13	.13½	.13	.13½	.12½	.13½
Grade 2	gal.	.113	.12½	.113	.12½	.109	.12
Cresol, USP, drs	lb.	.10	.10½	.10	.10½	.10	.10½
Crotonaldehyde, 98%, drs, wks	lb.	.26	.30	.26	.30	.26	.30
Cutch, Philippine, 100 lb bale	lb.	.04	.04¾	.04	.04¾	.04	.04¾
Cyanamid, bgs, c-l, frt allowed Ammonia unit		...	1.12½	1.10	1.12½	1.07½	1.10
Derris root 5% rotenone, bbls	lb.	.39	.47	.39	.47	...	...
Dextrin, corn, 140 lb bgs f.o.b., Chicago 100 lb.		4.35	4.55	4.35	4.55	3.45	5.00
British Gum, bgs 100 lb.		4.60	4.80	4.60	4.80	3.70	5.40
Potato, Yellow, 220 lb bgs	lb.	.07¾	.08¾	.07¾	.08¾	.07¾	.08¾
White, 220 lb bgs, lcl	lb.	.08	.09	.08	.09	.08	.09
Tapioca, 200 bgs, lcl	lb.	.	.08	.	.08	.	.08
White, 140 lb bgs 100 lb.		4.30	4.58	4.30	4.58	3.40	4.95
Diamylamine, drs, wks	lb.	.	.75	.	.75	.75	1.00
Diamylene, drs, wks	lb.	.095	.102	.095	.102	.095	.102
tks, wks	lb.	.	.08½	.	.08½	.	.08½
Diamylether, wks, drs	lb.	.085	.092	.085	.092	.085	.092
tks, wks	lb.	...	.075	...	.075	...	.075
Oxalate, lcl, drs, wks	lb.	...	.30	...	.30	...	.
Diamylphthalate, drs, wks	lb.	.19	.19½	.19	.19½	.18	.19½
Diamyl Sulfide, drs, wks	lb.	.	1.10	.	1.10	.	1.10
Dianisidine, bbls	lb.	2.25	2.45	2.25	2.45	2.25	2.45
Dibutyl Ether, drs, wks, lcl	lb.	...	.30	...	.30	...	...
Dibutylphthalate, drs, wks, frt allowed	lb.	.19½	.20	.19½	.20	.18	.21
Dibutyltartrate, 50 gal drs	lb.	...	.50	.	.50	.35	.40
Dichlorethylene, drs	gal.	.29	...	.29	...	.29	...
Dichloroethylether, 50 gal drs, wks	lb.	.15	.16	.15	.16	.16	.17
tks, wks	lb.	...	.14	...	.14	...	.15
Dichloromethane, drs, wks	lb.	...	.23	...	.23	.	.23
Dichloropentanes, drs, wks	lb.	no prices		no prices		.032	.040
tks, wks	lb.	no prices		no prices		.	.02½
Diethanolamine, tks, wks	lb.	.31	.35	.31	.35		.30
Diethylamine, 400 lb drs	lb.	2.75	3.00	2.75	3.00	2.75	3.00
Diethylaniline, 850 lb drs	lb.	.50	.52	.50	.52	.50	.55
Diethyl Carbinol, drs	lb.	.60	.75	.60	.75	.60	.75
Diethylcarbonate, com drs	lb.	.31⅜	.35	.31⅜	.35	.31⅜	.35
90% grade, drs	lb.	.	.25	.	.25	...	.25
Diethylorthotoluidin, drs	lb.	.64	.67	.64	.67	.64	.67
Diethylphthalate, 1000 lb drs	lb.	.18	.18½	.18	.18½	.18	.19
Diethylsulfate, tech, drs, wks, lcl	lb.	...	.20	...	.20	.	.20
Diethyleneglycol, drs	lb.	.16½	.17½	.16½	.17½	.15½	.17½
Mono ethyl ethers, drs	lb.	.16	.17	.16	.17	.15	.17
tks, wks	lb.	...	.15	...	.15	...	.15
Mono butyl ether, drs	lb.	...	.26	...	.26	...	.26
Diethylene oxide, 50 gal drs, wks	lb.	.20	.24	.20	.24	.20	.24
Diglycol Oleate, bbls	lb.	...	.24	...	.24	...	.24
Dimethylamine, 400 lb drs, pure 25 & 40% sol 100% basis	lb.	.	1.00	.	.95	.	.95
Dimethylaniline, 340 lb drs	lb.	.26	.27	.26	.27	.26	.30
Dimethyl Ethyl Carbinol, drs	lb	.60	.75	.60	.75	.60	.75
Dimethyl phthalate, drs, wks, frt allowed	lb.	.20½	.21	.20½	.21	.19½	.21½
Dimethysulfate, 100 lb drs	lb.	.45	.50	.45	.50	.45	.50
Dinitrobenzene, 400 lb bbls	lb. *k*	.16	.19	.16	.19	.16	.19½
Dinitrochlorobenzene, 400 lb bbls	lb.	.16	.17	.16	.17	.14	.15½
Dinitronaphthalene, 350 lb bbls	lb.	.35	.38	.35	.38	.34	.37
Dinitrophenol, 350 lb bbls	lb.	.23	.24	.23	.24	.23	.24
Dinitrotoluene, 300 lb bbls	lb.	.14½	.15½	.14½	.15½	.14½	.16½
Diphenyl, bbls	lb.	.15	.25	.15	.25	.15	.25
Diphenylamine	lb.	.31	.32	.31	.32	.31	.32
Diphenylguanidine, 100 lb drs	lb.	.35	.37	.35	.37	.35	.37

k Higher price is for purified material.



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Prices

		Current Market	1937 Low	1937 High	1936 Low	1936 High
Dip Oil, see Tar Acid Oil.						
Divi Divi pods, bgs shipmt	ton	34.00	nom.	34.00	nom.	32.00	45.00
Extract	lb.	.05	.05½	.05	.05½	.05	.05½
EGG YOLK							
Egg Yolk, dom., 200 lb cases	lb.	.68	nom.	.68	nom.	.63	.68
Imported	lb.	.53	.56	.53	.56	.48	.56
Epsom Salt, tech, 300 lb bbls							
c-l NY	100 lb.	1.80	2.00	1.80	2.00	1.80	2.00
USP, c-l, bbls	100 lb.	...	2.00	...	2.00	...	2.00
Ether, USP anaesthesia 55 lb drs	lb.	.22	.23	.22	.23	.22	.23
(Conc)	lb.	.09	.10	.09	.10	.09	.10
Isopropyl 50 gal drs	lb.	.07	.08	.07	.08	.07	.08
tks, frt allowed	lb.	...	.06	...	.06	...	.06
Nitrous, conc, bottles	lb.	.75	.77	.75	.77	.75	.77
Synthetic, wks, drs	lb.	.08	.09	.08	.09	.08	.09
Ethyl Acetate, 85% Ester tks, frt alld	lb.	...	.06½	...	.06½	.06½	.08
drs, frt alld	lb.	...	.07½	...	.07½	.07½	.09
95%, tks, frt allowed	lb.	...	.06¾	...	.06¾	.07	.08½
drs, frt alld	lb.	...	.07¾	...	.07¾	.08	.10
Acetoacetate, 110 gal drs	lb.	...	.27½	...	.27½	.37	.68
Benzylaniline, 300 lb drs	lb.	.86	.88	.86	.88	.86	.88
Bromide, tech, drs	lb.	.50	.55	.50	.55	.50	.55
Chloride, 200 lb drs	lb.	.22	.24	.22	.24	.22	.24
Chlorocarbonate, cbys	lb.	...	.30	...	.30	...	.30
Crotonate, drs	lb.	1.00	1.25	1.00	1.25	1.00	1.25
Ether, Absolute, 50 gal drs	lb.	.50	.52	.50	.52	.50	.52
Formate, drs, frt allowed	lb.	•••	•••	1[f]•	•••	1[f]•	•••
Lactate, drs, wks	lb.	...	.33	...	.33	.25	.29
Methyl Ketone, 50 gal drs, frt allowed	lb.	.07	.07½	.07	.07½	.07	.09
tks, frt allowed	lb.	...	.06½	...	.06½	.06½	.07½
Oxalate, drs, wks	lb.	.30	.34	.30	.34	.37½	.55
Oxybutyrate, 50 gal drs, wks	lb.	.30	.30½	.30	.30½	.30	.30½
Silicate, drs, wks	lb.	...	.77	...	.77	...	...
Ethylene Dibromide, 60 lb drs	lb.	.65	.70	.65	.70	.65	.70
Chloryhdrin, 40%, 10 gal cbys chloro, cont	lb.	.75	.85	.75	.85	.75	.85
Anhydrous	lb.	...	.75	...	.75	...	.75
Dichloride, 50 gal drs, wks	lb.	.0545	.0994	.0545	.0994	.0545	.0994
Glycol, 50 gal drs, wks	lb.	.17	.21	.17	.21	.17	.21
tks, wks	lb.	...	.16	...	.16	...	.16
Mono Butyl Ether, drs, wks	lb.	.20	.21	.20	.21	.20	.21
tks, wks	lb.	...	.19	...	.19	...	.19
Mono Ethyl Ether, drs, wks	lb.	.16	.17	.16	.17	.16	.17
tks, wks	lb.	...	.15	...	.15	...	.15
Mono Ethyl Ether Acetate, drs, wks	lb.	...	.14	...	.14	.14	.18½
tks, wks	lb.	...	.13	...	.13	.13	.16½
Mono, Methyl Ether, drs wks	lb.	.18	.22	.18	.22	.19	.23
tks, wks	lb.	...	.17	...	.17	.	.18
Oxide, cyl	lb.	.50	.55	.50	.55	.50	.60
Ethylidenaniline	lb.	.45	.47½	.45	.47½	.45	.47½
Feldspar, blk pottery	ton	...	14.50	...	14.50	.	14.50
Powd, blk, wks	ton	14.00	14.50	14.00	14.50	14.00	14.50
Ferric Chloride, tech, crys, 475 lb bbls	lb.	.05	.07½	.05	.07½	.05	.07½
sol, 42° cbys	lb.	.06¼	.06½	.06¼	.06½	.06¼	.06½
Fish Scrap, dried, unground, wks	unit *l*	...	nom.	...	nom.	2.50	3.50
Acid, Bulk, 6 & 3%, delv Norfolk & Baltimore basis	unit *m*	...	nom.	...	nom.	.	2.25
Fluorspar, 98%, bgs	lb.	no prices		no prices		30.00	35.50
Formaldehyde, USP, 400 lb bbls, wks	lb.	.05¾	.06¼	.05¾	.06¼	.05¾	.07
Fossil Flour	lb.	.02½	.04	.02½	.04	.02½	.04
Fullers Earth, blk, mines	ton	6.50	15.00	6.50	15.00	6.50	15.00
Imp powd, c-l, bgs	ton	23.00	30.00	23.00	30.00	23.00	30.00
Furfural (tech) drs, wks	lb.	.10	.15	.10	.15	.10	.15
Furfuramide (tech) 100 lb drs	lb.	...	.30	...	.30	...	.30
Fusel Oil, 10% impurities	lb.	.16	.18	.16	.18	.16	.18
Fustic, crystals, 100 lb boxes	lb.	.20	.23	.20	.23	.20	.23
Liquid 50°, 600 lb bbls	lb.	.08½	.12	.08½	.12	.08½	.12
Solid, 50 lb boxes	lb.	.16	.18	.16	.18	.16	.18
G SALT PASTE							
G Salt paste, 360 lb bbls	lb.	.45	.47	.45	.47	.45	.47
Gall Extract	lb.	.19	.20	.19	.20	.18	.20
Gambier, com 200 lb bgs	lb.	...	nom.	...	nom.	...	.06
Singapore cubes, 150 lb bgs	100 lb.	.09½	.10½	.09½	.10½	.08	.09
Gelatin, tech, 100 lb cs	lb.	.50	.55	.50	.55	.50	.55
Glauber's Salt, tech, c-l, bgs, wks*	100 lb.	.95	1.15	.95	1.15	.95	1.30
Anhydrous, see Sodium Sulfate.							
Glue, bone, com grades, c-l bgs	lb.	.11	.17½	.11	.17½	.10½	.17½
Better grades, c-l, bgs	lb.	.12½	.17½	.12½	.17½	.12	.17½
Casein, kgs	lb.	.18	.22	.18	.22	.18	.22

l + 10; *m* + 50; *Bbls. are 20c higher.

Current

Glycerin
Gum, Hemlock

	Current Market	1937 Low	1937 High	1936 Low	1936 High
Glycerin, CP, 550 lb drs ..lb.	...	.29	...	.29	.16	.21½
Dynamite, 100 lb drs ...lb.	...	.29	...	.29	.13¾	.21½
Saponification, drs .....lb.	...	.29	...	.29	.10¾	.22
Soap Lye, drs .....lb.	...	.27	...	.27	.09¼	.20
Glyceryl Phthalate .....lb.	...	.29	...	.29	.28	.29
Glyceryl Stearate, bbls ...lb.	...	.18	...	.18	...	.18
Glycol Phthalate, drs .....lb.	...	.29	...	.29	.29	.35
Glycol Stearate, drs .....lb.	...	.23	...	.23	...	.23
GUMS						
Gum Aloes, Barbadoes ....lb.	.85	.90	.85	.90	.85	.90
Arabic, amber sorts .....lb.	.10½	.11	.10½	.11	.09	.10¾
White sorts, No. 1, bgs..lb.	.27	.28	.27	.28	.25	.28
No. 2, bgs .....lb.	.25	.26	.25	.26	.24	.26
Powd, bbls .....lb.	.14	.15	.14	.15	.13	.14
Asphaltum, Barbadoes (Manjak) 200 lb bgs, f.o.b., NY .....lb.	.02½	.10½	.02½	.10½	.02½	.10½
California, f.o.b., NY, drs .....ton	29.00	55.00	29.00	55.00	29.00	55.00
Egyptian, 200 lb cases, f.o.b., NY .....lb.	.12	.15	.12	.15	.12	.15
Benzoin Sumatra, USP, 120 lb cases .....lb.	.18	.19	.18	.19	.15	.19
Copal, Congo, 112 lb bgs, clean, opaque .....lb.	...	.18⅞	...	.18⅞	.18½	.20
Dark amber .....lb.	...	.06⅞	...	.06⅞	.06⅞	.08
Light amber .....lb.	...	.10¼	...	.10¼	.10¼	.14⅛
Copal, East India, 180 lb bgs						
Macassar pale bold .....lb.	...	.13	...	.13	.12⅝	.14
Chips .....lb.	...	.06½	...	.06½	.06⅛	.06½
Dust .....lb.	.03⅝	.04⅛	.03⅝	.04⅛	.03⅝	.04⅛
Nubs .....lb.	...	.11¼	...	.11¼	.10⅜	.11⅛
Singapore						
Bold .....lb.	...	.15⅝	...	.15⅝	.15⅛	.16⅞
Chips .....lb.	...	.05	...	.05	.04⅜	.05¼
Dust .....lb.	.03⅝	.04⅛	.03⅝	.04⅛	.03⅝	.04⅛
Nubs .....lb.	...	.10¾	...	.10¾	.10	.11¼
Copal Manilla, 180-190 lb baskets, Loba A .....lb.	...	.09¾	...	.09¾	.09¼	.13
Loba B .....lb.	...	.09¼	...	.09¼	.08⅞	.12
Loba C .....lb.	...	.08⅞	...	.08⅞	.08⅜	.11⅛
DBB .....lb.	...	.08⅜	.08	.08⅜	.07⅝	.08⅞
Dust .....lb.	...	.06⅛	.05¾	.06⅛	.05	.06⅛
MA sorts .....lb.	...	.07¼	.06¾	.07¼	.06¾	.07⅝
Copal Pontianak, 224 lb cases, bold genuine .....lb.	...	.16	.15½	.16	.14¼	.16
Chips .....lb.	...	.11⅛	.09⅛	.11⅛	.07	.08½
Mixed .....lb.	...	.14	.13½	.14	.13¼	.13¾
Nubs .....lb.	...	.13½	.12¾	.13½	.10¼	.12
Split .....lb.	...	.14⅛	.13½	.14⅛	.12¾	.13
Dammar Batavia, 136 lb cases						
A .....lb.	...	.23½	...	.23½	.21⅜	.22¼
B .....lb.	...	.22⅛	...	.22⅛	.20⅜	.21½
C .....lb.	...	.18½	...	.18½	.16½	.17⅝
D .....lb.	...	.15⅝	...	.15⅝	.13⅝	.14⅜
A/D .....lb.	...	.18½	...	.18½	.15½	.17⅛
A/E .....lb.	...	.15¼	...	.15¼	.12⅞	.14½
E .....lb.	...	.08⅛	.07½	.08⅛	.06¾	.07⅛
F .....lb.	...	.06¼	...	.06¼	.05⅞	.06⅞
Singapore						
No. 1 .....lb.	...	.18	.17⅛	.18	.16¼	.17½
No. 2 .....lb.	...	.15	.14⅛	.15	.13	.14¼
No. 3 .....lb.	...	.05¾	..	.05¾	.05¼	.05¾
Chips .....lb.	...	.10⅞	.10¼	.10⅞	.09¾	.09¾
Dust .....lb.	...	.06	.05¾	.06	.04¼	.05⅝
Seeds .....lb.	...	.08½	.07⅞	.08½	.06⅝	.07⅜
Elemi, cons .....lb.	.09¾	.10¼	.09¾	.10¼	.09¾	.10¼
Ester .....lb.	.11½	.12	.11½	.12	.07⅝	.10
Gamboge, pipe, cases .....lb.	.58	.59	.58	.59	.58	.59
Powd, bbls .....lb.	.65	.66	.65	.66	.65	.66
Ghatti, sol. bgs .....lb.	.11	.15	.11	.15	.11	.15
Karaya, powd, bbls, xxx..lb.	.24	.25	.24	.25	.24	.25
xx .....lb.	.16	.17	.16	.17	.16	.17
No. 1 .....lb.	.09½	.10	.09½	.10	.09½	.10
No. 2 .....lb.	.08½	.09	.08½	.09	.08½	.09
Kauri, NY, San Francisco, Brown XXX, cases ....lb.	.60	.60½	.60	.60½	.60	.60½
BX .....lb.	.33	.33½	.33	.33½	.33	.33½
B1 .....lb.	...	.21	...	.21	.19	.21
B2 .....lb.	...	.15½	...	.15½	.14½	.15½
B3 .....lb.	.12	.12½	.12	.12½	.12	.12½
Pale XXX .....lb.	.65	.65½	.65	.65½	.65	.65½
No. 1 .....lb.	.40	.40½	.40	.40½	.40	.40½
No. 2 .....lb.	.22	.22½	.22	.22½	.22	.22½
No. 3 .....lb.	.15	.15½	.15	.15½	.15	.15½
Kino, tins .....lb.	.70	.80	.70	.80	.70	.80
Mastic .....lb.	.57	.58	.57	.58	.56	.60½
Sandarac, prime quality, 200 lb bgs & 300 lb cks ...lb.	.33	.35	.33	.35	.19½	.38
Senegal, picked bgs .....lb.	.20	.21	.20	.21	.20	.21
Sorts .....lb.	.09¾	.10¼	.09¾	.10¼	.09¾	.12½
Thus, bbls .....280 lbs.	...	12.00	...	12.00	11.00	12.00
Strained .....280 lbs.	...	12.00	...	12.00	11.00	12.00
Tragacanth, No. 1, cases..lb.	...	2.75	2.40	2.75	1.20	2.50
No. 2 .....lb.	...	2.35	2.00	2.35	1.10	2.10
No. 3 .....lb.	...	2.30	1.95	2.30	.95	2.05
No. 4 .....lb.	...	2.25	1.85	2.25	.85	1.95
No. 5 .....lb.	...	2.00	1.65	2.00	.75	1.75
Yacca, bgs .....lb.	.03¼	.03¾	.03¼	.03¾	.03¼	.03¾
Helium, cyl (200 cu. ft.) cyl.	...	25.00	...	25.00	...	25.00
Hematine crystals, 400 lb bbls .....lb.	.16	.18	.16	.18	.16	.18
Hemlock, 25%, 600 lb bbls, wks .....lb.	...	.03⅛	...	.03⅛	...	.02⅞
tks .....lb.	...	.02¾	...	.02¾	...	.02½

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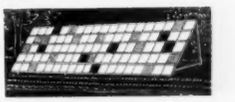

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		Current Market	1937 Low	1937 High	1936 Low	1936 High
Hexalene, 50 gal drs, wks	lb.	.30	...	.30	...	.30
Hexane, normal 60-70° C. Group 3, tks	gal.	.10½	...	.10½	...	.12
Hexamethylenetetramine, powd, drs	lb.	.36	.35	.36	.35	.39
Hexyl Acetate, delv, drs	lb.	.10	...	.10	.10	.12½
tks	lb.	.09	...	.09	.09	.11½
Hoof Meal, f.o.b. Chicago unit		3.50	...	3.50	2.35	3.00
Hydrogen Peroxide, 100 vol, 140 lb cbys	lb.	.21	.20	.21	.20	.21
Hydroxyamine Hydrochloride	lb.	3.15	...	3.15	...	3.15
Hypernic, 51°, 600 lb bbls	lb.	.20	.15	.20	.17	.20
INDIGO						
Indigo, Bengal, bbls	lb.	2.40	...	2.40	...	...
Synthetic, liquid	lb.	.19	.16½	.19	.13	.14
Iodine, Resublimed, kgs	lb.	1.55	1.50	1.55	1.50	1.75
Irish Moss, ord, bales	lb.	.12	.11	.12	.09	.10
Bleached, prime, bales	lb.	.21	.20	.21	.18	.19
Iron Acetate Liq. 17°, bbls	lb.	.04	.03	.04	.03	.04
Chloride see Ferric Chloride.						
Nitrate, coml, bbls 100	lb.	3.25	2.75	3.25	2.75	3.25
Isobutyl Carbinol (128-132°C) drs, wks	lb.	.34	.33	.34	.33	.34
tks, wks	lb.	.32	...	.32	...	.32
Isopropyl Acetate, tks, frt allowed	lb.	.06½	...	.06½	.06	.07½
drs, frt allowed	lb.	.08	.07½	.08	.07	.09
Ether, see Ether, isopropyl.						
Keiselguhr, 95 lb bgs, NY, Brown	ton	70.00	60.00	70.00	60.00	70.00
LEAD ACETATE						
Lead Acetate, f.o.b. NY, bbls, White, broken	lb.	.11½	...	.11½	.11	.11½
cryst, bbls	lb.	.11½	...	.11½	.10½	.11½
gran, bbls	lb.	.12¼	...	.12¼	.11	.12¼
powd, bbls	lb.	.12¼	...	.12¼	.11¼	.12¼
Arsenate, East, drs	lb.	.11	...	.11	.09	.10
Dealers, drs	lb.	.10½	...	.10½	.09¼	.10¾
West, drs	lb.	.11	...	.11	.09	.09¾
Dealers, drs	lb.	.10½	...	.10½	.09½	.10
Linoleate, solid, bbls	lb.	.18	...	.18	.18	.26½
Metal, c-l, NY	100 lb.	7.05	6.00	7.05	4.50	6.00
Nitrate, 500 lb bbls, wks	lb.	.09½	.09	.09½	.09	.09½
Oleate, bbls	lb.	.16	.15	.16	.15	.16
Red, dry, 95% Pb_2O_4, delv	lb.	.09½	.08½	.09½	.07	.085
97% Pb_2O_4, delv	lb.	.09¾	.08¾	.09¾	.07¼	.08¾
98% Pb_2O_4, delv	lb.	.10	.09	.10	.07½	.09
Resinate, precip, bbls	lb.	.16½	.14	.16½	...	.14
Stearate, bbls	lb.	.23	.22	.23	.22	.25
Titanate, bbls, c-l, f.o.b. wks, frt allowed	lb.	.10	...	.10	...	...
White, 500 lb bbls, wks	lb.	.08¼	.07¼	.08¼	.06½	.07¼
Basic sulfate, 500 lb bbls, wks	lb.	.07½	.06¾	.07½	.06	.06½
Lime, chemical quicklime, f.o.b., wks, bulk	ton	8.00	6.00	8.00	7.00	7.25
Hydrated, f.o.b., wks	ton	12.00	8.00	12.00	8.50	12.00
Lime Salts, see Calcium Salts.						
Lime sulfur, dealers, tks	gal.	.11	...	.11	...	.11
drs	gal.	.16	.13	.16	.13	.16
Linseed Meal, bgs	ton	42.50	...	42.50	29.00	40.50
Litharge, coml, delv, bbls	lb.	.08½	.07½	.08½	.06	.075
Lithopone, dom, ordinary, delv, bgs	lb.	.04¼	.04¼	.04¼	.04½	.04¼	.04¾
bbls	lb.	.04½	.04¾	.04½	.04¾	.04½	.05
High strength, bgs	lb.	.05¾	.06	.05¾	.06	.05¾	.06¼
bbls	lb.	.06	.06¼	.06	.06¼	.06	.06½
Titanated, bgs	lb.	.05¾	.06	.05¾	.06	.05¾	.06¼
bbls	lb.	.06	.06¼	.06	.06¼	.06	.06½
Logwood, 51°, 600 lb bbls	lb.	.08½	.10½	.08½	.10½	.06½	.10½
Solid, 50 lb boxes	lb.	.13½	.17½	.13½	.17½	.13½	.17½
Sticks	ton	24.00	25.00	24.00	25.00	24.00	26.00
MADDER						
Madder, Dutch	lb.	.22	.25	.22	.25	.22	.25
Magnesite, calc, 500 lb bbl	ton	60.00	65.00	60.00	65.00	60.00	65.00
Magnesium Carb, tech, 70 lb bgs, wks	lb.	.06	.06½	.06	.06½	.06	.06½
Chloride flake, 375 lb drs, c-l, wks	ton	39.00	42.00	39.00	42.00	36.00	42.00
Fluosilicate, crys, 400 lb bbls, wks	lb.	.10	.10½	.10	.10½	.10	.10½
Oxide, USP, light, 100 lb bbls	lb.	.36	.40	.36	.40	...	.42
Heavy, 250 lb bbls	lb.	...	.50	...	.50	...	.50
Palmitate, bbls	lb.	.33	nom.	.33	nom.	.23	.24
Silicofluoride, bbls	lb.	.09½	.10½	.09½	.10½	...	...
Stearate, bbls	lb.	.21	.24	.21	.24	.20	.24
Manganese acetate, drs	lb.	.25½	.26½	.25½	.26½	...	...
Borate, 30%, 200 lb bbls	lb.	.15	.16	.15	.16	.15	.16
Chloride, 600 lb cks	lb.	.09	.12	.09	.12	.09	.12
Dioxide, tech (peroxide), paper bgs, c-l	ton	...	47.50	...	47.50	...	47.50
Hydrate, bbls	lb.	...	.80	...	.80	...	...
Linoleate, liq, drs	lb.	.18	.19¼	.18	.19¼	...	...
solid, precip, bbls	lb.	.17½	.19	.17½	.19	...	...
Resinate, fused, bbls	lb.	.08¼	.08½	.08¼	.08½	...	...
precip, drs	lb.	...	.12	...	.12	...	...
Sulfate, tech, anhyd, 90-95%, 550 lb drs	lb.	.07	.07½	.07	.07½	...	...
Mangrove, 55%, 400 lb bbls	lb.	...	.04	...	.04	...	.04
Bark, African	ton	26.00	27.00	26.00	27.00	25.50	27.00

	Current Market	1937 Low	1937 High	1936 Low	1936 High
Mannitol, pure cryst, cs, wks lb.	...	1.48	...	1.48	1.48	1.60
Marble Flour, blk ..... ton	12.00	13.00	12.00	13.00	12.00	13.00
Mercuric chloride ..... lb.	...	1.20	...	1.20	.81	1.20
Mercury metal ...76 lb. flasks	92.00	94.00	92.00	95.00	73.50	95.00
Meta-nitro-aniline ..... lb.	.67	.69	.67	.69	.67	.69
Meta-nitro-paratoluidine 200 lb bbls ..... lb.	1.45	1.55	1.45	1.55	1.40	1.55
Meta-phenylene-diamine 300 lb bbls ..... lb.	.80	.84	.80	.84	.80	.84
Meta-toluene-diamine, 300 lb bbls ..... lb.	.65	.67	.65	.67	.65	.69
Methanol, denat, grd, drs, c-l, frt all'd ..... gal.	...	.53	...	.53	...	...
contracts ..... gal.	...	.50	...	.50	...	...
tanks, frt all'd ..... gal.	...	.48	...	.48	...	...
contracts, frt all'd .. gal.	...	.45	...	.45	...	...
Pure, drs, c-l, frt all'd gal.	...	.38	...	.38	...	...
tanks ..... gal.	...	.33	...	.33	...	...
95%, tks ..... gal.	...	.31	...	.31	...	...
97%, tks ..... gal.	...	.32	...	.32	...	...
Methyl Acetate, dom, 98-100%, drs ..... lb.	.16	.17½	.16	.17½	.11	.18½
Acetone, frt all'd, drs gal. *p*	.45½	.58½	.45½	.58½	.45½	.68½
tks, frt allowed, drs gal. *p*	.41	.44½	.41	.44½	.41	.48
Synthetic, frt all'd, east of Rock M., drs ..... gal. *p*	.52½	.59½	.52½	.59½	.52½	.60
tks, frt all'd ... gal.	.48	.49½	.48	.49½	.48	.53
West of Rocky M., frt all'd, drs .. gal. *p*	.55½	.58	.55½	.58	.55½	.69
tks, frt all'd .. gal. *p*	...	.51	...	.51	.51	.63½
Anthraquinone ..... lb.	.65	.67	.65	.67	.65	.67
Butyl Ketone, tks ..... lb.	...	.10½	...	.10½	...	.10½
Chloride, 90 lb cyl ..... lb.	.37	.43	.37	.43	...	.45
Ethyl Ketone, tks ..... lb.	...	.07½	...	.07½	...	.07½
Formate, drs, frt allowed lb.	...	.39	...	.39	...	...
Hexyl Ketone, pure, drs lb.	...	.60	...	.60	...	.60
Lactate, drs, frt allowed lb.		.30	...	.30	...	...
Propyl carbinol, drs .... lb.	.60	.75	.60	.75	.60	.75
Mica, dry grd, bgs, wks .. lb.	35.00		35.00	...	35.00	...
Michler's Ketone, kgs .... lb.	...	2.50	...	2.50	...	2.50
Molasses, blackstrap, tks, f.o.b. NY ..... gal.	...	.07¼	...	.07¼	.07	.08¼
Monoamylamine, drs, wks lb.	...	1.00	...	1.00	...	1.00
Monochlorobenzene, see Chlorobenzene, mono.						
Monoethanolamine, tks, wks lb.	...	.30	...	.30	...	.30
Monomethylamine, drs, frt all'd, E. Mississippi, c-l .. lb.	...	.65	...	.65	...	...
Monomethylparaminosulfate, 100 lb drs ..... lb.	3.75	4.00	3.75	4.00	3.75	4.00
Myrobalans 25%, liq bbls .. lb.	...	.04¼	...	.04¼	...	.04¼
50% Solid, 50 lb boxes lb.	.06	.06¼	.06	.06¼	.06	.06¼
J1 bgs ..... ton	...	27.00	27.00	28.00	22.00	26.50
J2 bgs ..... ton	...	20.75	...	20.75	14.25	16.75
R2 bgs ..... ton	...	20.25	...	20.25	14.00	16.25
NAPHTHA						
Naphtha, v.m.&p. (deodorized) see petroleum solvents.						
Naphtha, Solvent, water-white, tks ..... gal.	...	.31	...	.31	...	.31
drs, c-l ..... gal.	...	.36	...	.36	...	.36
NAPHTHALENE						
Naphthalene, dom, crude, bgs, wks ..... lb.	2.80	3.00	2.80	3.00	2.75	4.50
Imported, cif, bgs .... lb.	2.80	3.00	2.80	3.00	...	...
Balls, flakes, pks ..... lb.	...	.08	...	.08	.07¼	.08
Balls, ref'd, bbls, wks .. lb.	...	.07¼	...	.07¼	.06¾	.07¼
Dyestuffs, bgs, bbls, wks lb.	...	.07¼	...	.07¼	.06	.07
Flakes, ref'd, bbls, wks .. lb.	...	.07¼	...	.07¼	.06¾	.07¼
Nickel Carbonate, bbls .... lb.	...	.36	...	.36	...	.36
Chloride, bbls ..... lb.	.18	.19	.18	.19	.18	.19
Metal ingot ..... lb.	...	.35	...	.35	...	.35
Oxide, 100 lb kgs, NY .. lb.	.35	.37	.35	.37	.35	.37
Salt, 400 lb bbls, NY ... lb.	.13	.13½	.13	.13½	.13	.13½
Single, 400 lb bbls, NY lb.	.13	.13½	.13	.13½	.13	.13½
Nicotine, 40%, drs, sulfate, 55 lb drs ..... lb.	...	.76	...	.76	.75	1.17
Nitre Cake, blk ..... ton	...	16.00	...	16.00	12.00	14.00
Nitrobenzene, redistilled, 1000 lb drs, wks ..... lb.	.08	.10	.08	.10	.08	.11
tks ..... lb.	...	.07½	...	.07½	...	.08½
Nitrocellulose, c-l-l c-l, wks lb.	.22	.29	.26	.29	.26	.34
Nitrogenous Mat'l, bgs, imp unit	no prices		no prices		2.00	3.10
dom, Eastern wks .... unit	...	3.90	3.60	3.90	1.90	3.00
dom, Western wks .... unit	...	3.40	3.40	3.50	1.85	2.75
Nitronaphthalene, 550 lb bbls lb.	.24	.25	.24	.25	.24	.25
Nutgalls Alleppo, bgs ..... lb.	.20	.22	.20	.22	.16	.18
Chinese, bgs ..... lb.	.20	.22	.20	.22	.19	.20
OAK BARK						
Oak Bark Extract, 25%, bbls lb.	...	.03⅛	...	.03⅛	...	.03½
tks ..... lb.	...	.02¾	...	.02¾	...	.02¾
Octyl Acetate, tks, wks ... lb.	.16	.17	.16	.17	...	.15
Orange-Mineral, 1100 lb cks NY ..... lb.	...	.12½	.11¼	.12½	.10	.11¼
Orthoaminophenol, 50 lb kgs lb.	2.15	2.25	2.15	2.25	2.15	2.25
Orthoanisidine, 100 lb drs lb.	.70	.74	.70	.74	.82	.84
Orthochlorophenol, drs .... lb.	.35	.75	.35	.75	.50	.65
Orthocresol, drs, wks ..... lb.	.13½	.14½	.13½	.14½	.13	.15
Orthodichlorobenzene, 1000 lb drs ..... lb.	.05	.06	.05	.06	.05	.11½

o Country is divded in 4 zones, prices varying by zone; *p* Country is divided into 5 zones. Also see footnote directly above; *q* Naphthalene quoted on Pacific Coast F.A.S. Phila. or N. Y.

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Phloroglucinol

Prices

	Current Market		1937 Low	1937 High	1936 Low	1936 High
Orthonitrochlorobenzene, 1200 lb drs, wks ..... lb.	.28	.29	.28	.29	.28	.29
Orthonitroparachlorphenol, tins ..... lb.	.70	.75	.70	.75	.70	.75
Orthonitrophenol, 350 lb drs ..... lb.	.85	.90	.85	.90	.52	.80
Orthonitrotoluene, 1000 lb drs, wks ..... lb.	.07	.10	.07	.10	.07	.10
Orthotoluidine, 350 lb bbls, l-c-l ..... lb.	.14	.15	.14	.15	.14	.15
Osage Orange, cryst, bbls .. lb.	.17	.25	.17	.25	.17	.25
51° liquid ..... lb.	.07	.08	.07	.08	.07	.07¾
Paraffin, rfd, 200 lb cs slabs						
122-127° M P ..... lb.	.0445	.04½	.0445	.04½	.0445	.04½
128-132° M P ..... lb.	.04¾	.049	.04¾	.049	.04¾	.049
133-137° M P ..... lb.	.05½	.05¾	.05½	.05¾	.05½	.05¾
Para aldehyde, 110-55 gal drs ..... lb.	.16	.18	.16	.18	.16	.18
Aminoacetanilid, 100 lb kgs ..... lb.	...	.85	...	.85	...	.85
Aminohydrochloride, 100 lb kgs ..... lb.	1.25	1.30	1.25	1.30	1.25	1.30
Aminophenol, 100 lb kgs lb.	...	1.05	...	1.05	...	1.05
Chlorophenol, drs ..... lb.	.30	.45	.30	.45	.50	.65
Dichlorobenzene, 200 lb drs, wks ..... lb.	.16	.20	.16	.20	.16	.20
Formaldehyde, drs, wks lb.	.34	.35	.34	.35	.34	.39
Nitroacetanilid, 300 lb bbls ..... lb.	.45	.52	.45	.52	.45	.52
Nitroaniline, 300 lb bbls, wks ..... lb.	.45	.47	.45	.47	.47	.51
Nitrochlorobenzene, 1200 lb drs, wks ..... lb.	.23½	.24	.23½	.24	.23½	.24
Nitro-orthotoluidine, 300 lb bbls ..... lb.	2.75	2.85	2.75	2.85	2.75	2.85
Nitrophenol, 185 lb bbls lb.	.35	.37	.35	.37	.45	.50
Nitrosodimethylaniline, 120 lb bbls ..... lb.	.92	.94	.92	.94	.92	.94
Nitrotoluene, 350 lb bbls lb.	...	.35	...	.35	.36	.37
Para Tertiary amyl phenol, wks, drs, c-l ..... lb.	...	.26	...	.26	.26	.50
Phenylenedamine, 350 lb bbls ..... lb.	1.25	1.30	1.25	1.30	1.25	1.30
Toluenesulfonamide, 175 lb bbls ..... lb.	.70	.75	.70	.75	.70	.75
tks, wks ..... lb.	...	.31	...	.31	...	.31
Toluenesulfonchloride, 410 lb bbls, wks ..... lb.	.20	.22	.20	.22	.20	.22
Toluidine, 350 lb bbls, wks ..... lb.	.56	.58	.56	.58	.56	.60
Paris Green, dealer, drs, frt E. of Cleveland ..... lb.	.22	.24	.22	.24	...	.24
Pentane, normal, 28-38° C, group 3, tks ..... gal.	...	.09½	...	.09½	.09	.09½
drs, group 3 ..... gal.	.12½	.16	.12½	.16	.10	.16
Perchlorethylene, 100 lb drs, frt allowed ..... lb.	...	.10½	...	.10½	.10½	.15
Petrolatum, dark amber, bbls ..... lb.	.02⅝	.02⅞	.02⅝	.02⅞	.02⅝	.02⅞
Light, bbls ..... lb.	.03⅛	.03⅜	.03⅛	.03⅜	.03⅛	.03⅜
Medium, bbls ..... lb.	.02⅞	.03⅛	.02⅞	.03⅛	.02⅞	.03⅛
Dark green, bbls ..... lb.	.02½	.02¾	.02½	.02¾	.02½	.02¾
Red, bbls ..... lb.	.02⅛	.02⅝	.02⅛	.02⅝	.02⅛	.02⅝
White, lily, bbls ..... lb.	.06	.06¼	.06	.06¼	.06	.06¼
White, snow, bbls ..... lb.	.07	.07¼	.07	.07¼	.07	.07¼
Petroleum Ether, 30-60°, group, 3 tks ..... gal.	...	.13	...	.13	...	.13
drs, group 3 ..... gal.	.15	.16	.15	.16	.15	.16

PETROLEUM SOLVENTS AND DILUENTS

Cleaners naphthas, group 3, tks, wks ..... gal.	.07⅜	.07½	.07⅜	.07½	.07⅜	.07½
Bayonne, tks, wks ... gal.	...	.10	.09½	.10	.09	.09½
West Coast, tks .... gal.	...	.15	...	.15	...	.15
Hydrogenated, naphthas, frt allowed East, tks .... gal.	...	.16	...	.16	.15	.16
No. 2, tks ..... gal.	...	.18	...	.18	...	.18
No. 3, tks ..... gal.	...	.16	...	.16	...	.15
No. 4, tks ..... gal.	...	.18	...	.18	...	.18
Lacquer diluents, tks						
Bayonne ..... gal.	.12	.12½	.12	.12½	.12	.12½
Group 3, tks ..... gal.	.08⅜	.08½	.08⅜	.08½	.07⅞	.08½
Naphtha, V.M.P., East, tks, wks ..... gal.	...	.10½	.10	.10½	.09	.10
Group 3, tks, wks ... gal.	.07⅜	.07½	.07⅜	.07½	.07⅜	.07½
Petroleum thinner, East, tks, wks ..... gal.	.09½	.10	.09	.10	.09	.09½
Group 3, tks, wks ... gal.	.06⅜	.06⅝	.06⅜	.06⅝	.06⅜	.06⅝
Rubber Solvents, stand grd, East, tks, wks ..... gal.	...	.10	.09½	.10	.09	.09½
Group 3, tks, wks ... gal.	.07⅜	.07½	.07⅜	.07½	.07⅜	.07½
Stoddard Solvent, East, tks, wks ..... gal.	...	.10	.09½	.10	.09	.09½
Group 3, tks, wks ... gal.	.06⅞	.07	.06⅞	.07	.06⅞	.07
Phenol, 250-100 lb drs .... lb.	.13¼	.15	.13¼	.15	.13¼	.15
tks, wks ..... lb.	...	.12¾	...	.12¾	...	...
Phenyl-Alpha-Naphthylamine, 100 lb kgs ..... lb.	...	1.35	...	1.35	...	1.35
Phenyl Chloride, drs ..... lb.	...	.16	...	.16	...	.16
Phenylhydrazine Hydrochloride, com ..... lb.	2.30	6.50	2.30	6.50	2.90	3.00
Phloroglucinol, tech, tins .. lb.	15.00	16.50	15.00	16.50	15.00	16.50
CP, tins ..... lb.	20.00	22.00	20.00	22.00	20.00	22.00

		Current Market	1937 Low	1937 High	1936 Low	1936 High
Phosphate Rock, f.o.b. mines						
Florida Pebble, 68% basis	ton	1.85	...	1.85	...	1.85
70% basis	ton	2.35	...	2.35	...	2.35
72% basis	ton	2.85	...	2.85	...	2.85
75-74% basis	ton	3.85	...	3.85	...	3.85
75% basis	ton	5.50	...	5.50	...	4.35
Tennessee, 72% basis	ton	4.50	...	4.50	...	4.50
Phosphorus Oxychloride 175 lb cyl	lb.	.16	.20	.16	.20	.16	.20
Red, 110 lb cases	lb.	.40	.44	.40	.44	.40	.45
Sesquisulfide, 100 lb cs.	lb.	.38	.44	.38	.44	.38	.44
Trichloride, cyl	lb.	.16	.20	.16	.20	.16	.20
Yellow, 110 lb cs, wks	lb.	.28	.33	.28	.33	.28	.33
Phthalic Anhydride, 100 lb drs, wks	lb.	.14½	.15½	.14½	.15½	.14½	.15½
Pine Oil, 55 gal drs or bbls							
Destructive dist	lb.	.49	.50	.49	.50	.44	.50
Steam dist wat wh bbls	gal.	.64	.65	.64	.65	.64	.65
tks	gal.	...	.59	...	.59	...	.59
Straw color, bbls	gal.	...	.59	...	.59	...	.59
tks	gal.	...	.54	...	.54	...	.54
Pitch Hardwood, wks	ton	...	15.00	...	15.00	...	15.00
Coaltar, bbls, wks	ton	...	19.00	...	19.00	...	19.00
Burgundy, dom, bbls, wks	lb.	...	.03½	...	.03½	...	.03½
Imported	lb.	.11	.13	.11	.13	.11	.13
Petroleum, see Asphaltum in Gums' Section.							
Pine, bbls	bbl.	6.00	6.50	6.00	6.50	4.00	5.25
Stearin, drs	lb.	.03	.04½	.03	.04½	.03	.04½
Platinum, ref'd	oz.	56.00	66.00	45.00	68.00	34.50	64.00
POTASH							
Potash, Caustic, wks, sol	lb.	.06¼	.06½	.06¼	.06½	.06¼	.06½
flake	lb.	.07	.07⅜	.07	.07⅜	.07	.07⅜
Liquid, tks	lb.	...	.02⅞	...	.02⅞	...	.02⅞
Manure Salts, imported 20% basis, blk	ton	...	12.00	...	12.00	11.00	12.00
30% basis, blk	unit	...	.55	...	...	...	...
Potassium Acetate	lb.	.26	.28	.26	.28	.26	.28
Bicarbonate, USP, 320 lb bbls	lb.	.09	.18	.09	.18	.09	.18
Bichromate Crystals, 725 lb cks*	lb.	.08½	.09	.08½	.09	.08½	.09
Binoxalate, 300 lb bbls.	lb.	...	.23	...	.23	...	.23
Bisulfate, 100 lb kgs	lb.	.15½	.18	.15½	.18	.15½	.18
Carbonate, 80-85% calc 800 lb cks	lb.	.06½	.07	.06½	.07	.06½	.07½
liquid, tks	lb.	...	.02¾	...	.02¾	.02¾	.02⅞
drs, wks	lb.	.02⅞	.03½	.02⅞	.03½	.02⅞	.03¼
Chlorate crys, 112 lb kgs, wks	lb.	.09¼	.09½	.09¼	.09½	.09¼	.09½
gran, kgs	lb.	.12	.13	.12	.13	.12	.13
powd, kgs	lb.	.08½	.08¾	.08½	.08¾	.08	.08¼
Chloride, crys, bbls	lb.	.04	.04¾	.04	.04¾	.04	.04¾
Chromate, kgs	lb.	.28	.29	.28	.29	.23	.28
Cyanide, 110 lb cases	lb.	.55	.57½	.55	.57½	.55	.57½
Iodide, 75 lb bbls	lb.	.93	1.00	.93	1.15	1.10	1.25
Metabisulfite, 300 lb bbls	lb.	...	.15	...	.15	.13¾	.15
Muriate, bgs, dom, blk unit		...	.50	...	.50	.45	.50
Oxalate, bbls	lb.	.25	.26	.25	.26	.25	.26
Perchlorate, kgs, wks	lb.	.09	.11	.09	.11	.09	.11
Permanganate, USP, crys, 500 & 1000 lb drs, wks	lb.	.18½	.19½	.18½	.19½	.18½	.19½
Prussiate, red, bbls	lb.	.35	.37	.35	.37	.35	.38½
Yellow, bbls	lb.	.15	.16	.15	.18	.16	.19
Sulfate, 90% basis, bgs	ton	...	36.25	...	36.25	33.75	36.25
Titanium Oxalate, 200 lb bbls	lb.	.33	.35	.33	.35	.32	.35
Pot & Mag Sulfate, 48% basis bgs	ton	...	24.75	...	24.75	22.25	24.75
Propane, group 3, tks	lb.	.03	.04⅜	.03	.04⅜	.03	.04⅜
Putty, coml, tubs	100 lb.	...	2.90	2.90	3.00	2.75	3.00
Linseed Oil, kgs	100 lb.	...	4.65	4.65	4.75	4.50	4.75
Pyrethrum, conc liq: 2.4% pyretherins, drs, frt allowed	gal.	...	4.15	...	4.15	...	...
3.6% pyretherins, drs, frt allowed	gal.	...	6.10	...	6.10	...	...
Flowers, coarse, Japan, bgs	lb.	...	.12¾	...	.12¾	...	...
Fine powd, bbls	lb.	.14	.16	.14	.16	...	...
Pyridine, denat, 50 gal drs	gal.	...	1.30	...	1.30	...	1.30
Pyrites, Spanish cif Atlantic ports, blk	unit	.12	.13	.12	.13	.12	.13
Pyrocatechin, CP, drs, tins	lb.	2.15	2.75	2.15	2.75	2.15	2.75
Quebracho, 35% liq tks	lb.	...	.02⅞	...	.02⅞	.02⅝	.02⅞
450 lb bbls, c-l	lb.	...	.03¾	...	.03¾	.03⅛	.03¾
Solid, 63%, 100 lb bales cif	lb.	...	.03⅞	...	.03⅞	.03⅝	.03⅞
Clarified, 64%, bales	lb.	...	.04⅜	...	.04⅜	.03⅞	.04⅜
Quercitron, 51 deg liq, 450 lb bbls	lb.	.06	.06½	.06	.06½	.06	.06½
Solid, drs	lb.	.10	.12	.10	.12	.10	.12
R SALT							
R Salt, 250 lb bbls, wks	lb.	.52	.55	.52	.55	.52	.57
Resorcinol tech, cans	lb.	.75	.80	.75	.80	.75	.80
Rochelle Salt, cryst	lb.	.14½	.15	.14½	.15	.14	.15
Powd, bbls	lb.	.13½	.14	.13½	.14	.13	.14
Rosin Oil, bbls, first run	gal.	.71	.73	.71	.73	.38	.71
Second run	gal.	.73	.75	.73	.75	.43	.73
Third run, drs	gal.	.77	.79	.77	.79	.49	.77

* Spot price is ⅛c higher.

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Caustic Soda

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Oxalic Acid

Sodium Chlorate

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Persulphate of Potash

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ACETAMIDE

Manufacturer Synthetic Organic Chemicals

AMERICAN CHEMICAL PRODUCTS CO.
Rochester, N. Y.

Rosins
Sodium Nitrate

Prices

	Current Market	1937 Low	1937 High	1936 Low	1936 High
Rosins 600 lb bbls, 280 lb unit ex. yard NY:					
B	... 9.50	9 50	10.00	4.45	10 95
D	... 9.90	9.90	10.35	4.95	10.95
E	... 10.25		10.25	5.15	10.95
F	... 10.75	10.75	10.80	5.40	10.95
G	... 10.75	10.75	10.85	5.50	10 95
H	... 10.75	10 75	10.85	5.60	10 95
I	... 10.75	10.75	10.90	5.70	10.95
K	... 10.90		10.90	5.55	10 95
M	... 10.90	10.90	11.00	5.60	10.95
N	... 11.05		11.05	5.70	11.00
WG	... 11.05	11.05	11.75	5.85	11.00
WW	... 12.75	12.75	13.75	5.90	12.05
Rosins, Gum, Savannah (280 lb unit):					
B	... 8.25	8.25	8.75	3.15	9.70
D	... 8.65	8.65	9.00	3.75	9.70
E	... 8.95	8.95	9.10	3 90	9.70
F	... 9.50	9.50	9.55	4.10	9.70
G	... 9 50	9.50	9.60	4.20	9.70
H	... 9.50	9.50	9.60	4.30	9.70
I	... 9.50	9.50	9 65	4.35	9.70
K	... 9.65		9.65	4.30	9 70
M	... 9.65	9.65	9.75	4.35	9.70
N	... 9.75		9.75	4.45	9.75
WG	... 9.80	9.80	10.50	4.45	9.75
WW	... 11.50	11.50	12.50	4.55	10.80
X	... 11.50	11.50	12.50	4.55	10.80
Rosins, Wood, wks (280 lb unit), wks, FF	... 9.85		9.85	4.30	9.80
Rosin, Wood, c-l, FF grade, NY	... 10.66	10.66	10.72	6.10	10.52
Rotten Stone, bgs mines ton	... 35.00	...	35.00	...	35.00
Imported, lump, bbls lb.	... .12	...	...	...	...
Powdered, bbls lb.	.08½ .10	...	...	...	...
SAGO FLOUR					
Sago Flour, 150 lb bgs lb.	.02¾ .03¾	.02¾	.03¾	.02¾	.03¾
Sal Soda, bbls, wks 100 lb.	... 1.15	...	1.15	1 15	1.30
Salt Cake, 94-96%, c-l, wks ton	19.00 23.00	19.00	23.00	19.00	23.00
Chrome, c-l, wks ton	11.00 12.00	11.00	12.00	11.00	13.00
Saltpetre, gran, 450-500 lb bbls lb.	.06 .064	.06	.064	.059	.06¼
Cryst, bbls lb.	.07 .074	.07	.074	.069	.08
Powd, bbls lb.	.07 .074	.07	.074	.069	.07⅞
Satin, White, 550 lb bbls lb.	... .01½	...	.01½	...	.01½
Schaeffer's Salt, kgs lb.	.46 .48	.46	.48	.46	.50
Shellac, Bone dry, bbls lb. *r*	.21 .22	.21	.22	.17½	.26½
Garnet, bgs lb.	.16 .17	.16	.17	.16	.20
Superfine, bgs lb. *s*	.15 .18½	.15	.18½	.14½	.18½
T. N., bgs lb. *s*	.14 .14½	.14	.14½	.13½	.16
Silver Nitrate, vials oz.	.32⅝ .34⅝	.32⅝	.34⅝	.32⅛	.34⅞
Slate Flour, bgs, wks ton	9.00 10.00	9.00	10.00	9.00	10 00
Soda Ash, 58% dense, bgs, c-l, wks 100 lb.	... 1.25	...	1.25	...	1.25
58% light, bgs 100 lb.	... 1.23	...	1.23	...	1.23
blk 100 lb.	... 1.05	...	1.05	...	1.05
paper bgs 100 lb.	... 1.20	...	1.20	...	1.20
bbls 100 lb.	... 1.50	...	1.50	...	1.50
Caustic, 76% grnd & flake, drs 100 lb.	... 3.00	...	3.00	...	3.00
76% solid, drs 100 lb.	... 2.60	...	2.60	...	2.60
Liquid sellers, tks 100 lb.	... 2.25	...	2.25	...	2.25
Sodium Abietate, drs lb.	... .08	...	.08	...	.08
Acetate, tech, 450 lb bbls, wks lb.	.04¼ .05	.04¼	.05	.04½	.05
Alignate, drs lb.	... .64	...	.64	...	.64
Antimoniate, bbls lb.	.15 .15½	.13¾	.15½	.12	.14
Arsenate, drs lb.	.09½ .11½	.09½	.11½	...	.10½
Arsenite, liq, drs gal.	.40 .75	.40	.75	.40	.75
Benzoate, USP, kgs lb.	.46 .48	.46	.48	.46	.48
Bicarb, 400 lb bbl, wks 100 lb.	... 1.75	...	1.75	1.75	1.85
Bichromate, 500 lb cks, wks* lb.	.06½ .07	.06½	.07	.06½	.07
Bisulfite, 500 lb bbl, wks lb.	.03¼ .036	.03¼	.036	.03¼	.036
35-40% sol bbls, wks 100 lb.	1.40 1.80	...	...	...	...
Chlorate, bgs, wks lb.	.06¼ .07½	.06¼	.07½	.06¼	.07½
Cyanide, 96-98%, 100 & 250 lb drs, wks lb.	.15½ .17½	.15½	.17½	.15½	.17½
Fluoride, 90%, 300 lb bbls, wks lb.	.07½ .08¼	.07½	.08¼	.07¼	.08¼
Hydrosulfite, 200 lb bbls, f.o.b. wks lb.	.16 .17	.16	.17	.17	.19
Hyposulfite, tech, pea crys 375 lb bbls, wks 100 lb.	2.50 3.00	2.50	3.00	2.50	3.00
Tech, reg cryst, 375 lb bbls, wks 100 lb.	2.40 2.75	2.40	2.75	2.40	2.75
Iodide lb.	1.90 1.95	1.90	1.95	1.90	2.05
Metal, drs, 280 lbs lb.	... .19	...	.19	...	...
Metanilate, 150 lb bbls lb.	.41 .42	.41	.42	.41	.42
Metasilicate, gran, c-l, wks 100 lb.	... 2.15	...	2.15	2.15	3.00
cryst, bbls, c-l, wks 100 lb.	... 2.75	...	2.75	2.75	3.25
Monohydrate, bbls lb.	... .023	...	.023	...	.023
Naphthenate, drs lb.	... .09	...	.09	...	.09
Naphthionate, 300 lb bbl lb.	.52 .54	.52	.54	.52	.54
Nitrate, 92%, crude, 200 lb bgs, c-l, NY ton	... 26.80	...	26.80	24.80	26.80
100 lb bgs ton	... 27.50	...	27.50	25.50	27.50
Bulk ton	... 25.50	...	25.50	23.50	25.50

r Bone dry prices at Chicago 1c higher; Boston ½c; Pacific Coast 3c; Philadelphia deliveries f.o.b. N. Y.; refined 6c higher in each case; *s* T. N. and Superfine prices quoted f.o.b. N. Y. and Boston; Chicago prices 1c higher; Pacific Coast 3c; Philadelphia f.o.b. N. Y. * Spot price is ⅛c higher.

		Current Market		1937 Low	1937 High	1936 Low	1936 High
Sodium (continued):							
Nitrite, 500 lb bbls	lb.	.07	.10	.07	.10	.07	.08
Orthochlorotoluene, sulfonate, 175 lb bbls, wks	lb.	.25	.27	.25	.27	.25	.27
Perborate, drs, 400 lbs	lb.	.14¾	.15¼	.14¾	.15¼	.14¾	.18
Peroxide, bbls, 400 lb	lb.	...	.17	...	.17	...	.17
Phosphate, di-sodium, tech, 310 lb bbls, wks	100 lb.	...	1.90	...	1.90	1.95	2.30
bgs, wks	100 lb.	...	1.70	...	1.70	1.75	2.10
Tri-sodium, tech, 325 lb bbls, wks	100 lb.	...	2.05	...	2.05	1.95	2.30
bgs, wks	100 lb.	...	1.85	...	1.85	1.75	2.10
Picramate, 160 lb kgs	lb.	.65	.67	.65	.67	.65	.69
Prussiate, Yellow, 350 lb bbl, wks	lb.	.10	.11½	.10	.11½	.10	.12
Pyrophosphate, anhyd, 100 lb bbls	lb.	...	.10	...	.10	.10	.132
Silicate, 60°, 55 gal drs, wks	100 lb.	1.65	1.70	1.65	1.70	1.65	1.70
40°, 35 gal drs, wks	100 lb.	...	.80	...	.80	...	.80
tks, wks	100 lb.	...	.65	...	.65	...	.65
Silicofluoride, 450 lb bbls NY	lb.	.06½	.07	.06½	.07	.05¼	.07¼
Stannate, 100 lb drs	lb.	.35	.36	.33	.36	.28½	.37½
Stearate, bbls	lb.	.20	nom.	.20	nom.	.20	.26
Sulfanilate, 400 lb bbls	lb.	.16	.18	.16	.18	.16	.18
Sulfate Anhyd, 550 lb bgs* c-l, wks	100 lb. *t*	1.45	1.90	1.45	1.90	1.30	1.90
Sulfide, 80% cryst, 440 lb bbls, wks	lb.	...	.02¼	...	.02¼	...	.02¼
62% solid, 650 lb drs, c-l, wks	lb.	...	.02	...	.02	...	.03
Sulfite, cryst, 400 lb bbls, wks	lb.	.023	.02½	.023	.02½	.023	.02½
Sulfocyanide, drs	lb.	.28	.47	.28	.47	.28	.47
Sulforicinoleate, bbls	lb.	...	.12	...	.12	...	...
Tungstate, tech, crys, kgs	lb.	.80	.85	.85	.90	.85	.90
Sorbitol, com., drs, basis content, wks	lb.	...	.25	...	.25	...	...
Spruce Extract, ord, tks	lb.	...	.01	...	.01	...	.01
Ordinary, bbls	lb.	...	.01½	...	.01½	...	.01½
Super spruce ext, tks	lb.	...	.01⅝	...	.01⅝	...	.01⅝
Super spruce ext, bbls	lb.	...	.01⅞	...	.01⅞	...	.01⅞
Super spruce ext, powd, bgs	lb.	...	.04	...	.04	...	.04
Starch, Pearl, 140 lb bgs	100 lb.	3.78	3.98	3.78	3.98	2.99	4.30
Powd, 140 lb bgs	100 lb.	3.88	4.08	3.88	4.08	3.90	4.54
Potato, 200 lb bgs	lb.	.04½	.05½	.04½	.05½	.04½	.05½
Imp, bgs	lb.	.05	.06	.05	.06	.05	.06
Rice, 200 lb bbls	lb.	...	.07¼	...	.07¼	...	.07¼
Wheat, thick, bgs	lb.	.08¼	.08½	.08¼	.08½	.08¼	.08½
Strontium carbonate, 600 lb bbls, wks	lb.	.07¼	.07½	.07¼	.07½	.07¼	.07½
Nitrate, 600 lb bbls, NY	lb.	.07¾	.08¾	.07¾	.08¾	.08¾	.09½
Sucrose octa-acetate, den, grd, bbls, wks	lb.	.45	...	.45	...	.45	...
tech, bbls, wks	lb.	.40	...	.40	...	.40	...
Sulfur		...	...	...	...	...	...
Crude, f.o.b. mines	ton	18.00	19.00	18.00	19.00	18.00	19.00
Flour, coml, bgs	100 lb.	1.65	2.35	1.65	2.35	1.60	2.35
bbls	100 lb.	1.95	2.70	1.95	2.70	1.95	2.70
Rubbermakers, bgs	100 lb.	2.20	2.80	2.20	2.80	2.20	2.80
bbls	100 lb.	2.55	3.15	2.55	3.15	2.55	3.15
Extra fine, bgs	100 lb.	2.85	3.00	2.85	3.00	2.40	3.00
Superfine, bgs	100 lb.	2.65	2.80	2.65	2.80	2.20	2.80
bbls	100 lb.	2.25	3.10	2.25	3.10	2.25	3.10
Flowers, bgs	100 lb.	3.00	3.75	3.00	3.75	3.00	3.75
bbls	100 lb.	3.35	4.10	3.35	4.10	3.35	4.10
Roll, bgs	100 lb.	2.35	3.10	2.35	3.10	2.35	3.10
bbls	100 lb.	2.50	3.25	2.50	3.25	2.50	3.25
Sulfur Chloride, 700 lb drs, wks	lb.	.02½	.03½	...	...	...	...
Sulfur Dioxide, 150 lb cyl	lb.	.07	.09	.07	.09	.06½	.08½
Multiple units, wks	lb.	.04½	.07	.04½	.07	.05½	.06
tks, wks	lb.	.04	.05	.04	.05	.04½	.04¾
Refrigeration, cyl, wks	lb.	.15	.17	.15	.17	.10	.13
Multiple units, wks	lb.	.07½	.10	.07½	.10	.07	.09¼
Sulfuryl Chloride	lb.	.15	.40	.15	.40	.15	.40
Sumac, Italian, grd	ton	60.00	65.00	60.00	65.00	52.00	60.00
Extract, 42°, bbls	lb.	...	.05¼	...	.05¼	...	...
Superphosphate, 16% bulk, wks	ton	8.25	8.32½	8.25	8.32½	...	...
Run of pile	ton	...	8.00	...	8.00	...	...
Triple, 44-45%, a. p. a. bulk, wks, Balt. unit	ton	...	.70	...	.70	...	...
Talc, Crude, 100 lb bgs, NY	ton	13.00	15.00	13.00	15.00	13.00	15.00
Ref'd, 100 lb bgs, NY	ton	14.00	16.00	14.00	16.00	14.00	18.00
French, 220 lb bgs, NY	ton	23.00	30.00	23.00	30.00	22.00	30.00
Ref'd, white, bgs, NY	ton	45.00	60.00	45.00	60.00	45.00	60.00
Italian, 220 lb bgs to arr	ton	60.00	62.00	60.00	62.00	60.00	75.00
Ref'd, white, bgs, NY	ton	65.00	70.00	65.00	70.00	65.00	80.00
Tankage Grd, NY	unit *u*	...	4.00	4.00	4.40	2.65	4.25
Ungrd	unit *u*	...	3.90	3.90	4.35	2.40	4.25
Fert grade, f.o.b. Chicago	unit *u*	...	3.75	3.75	4.00	2.40	4.00
South American cif	unit *u*	...	4.00	4.00	4.25	2.70	3.90
Tapioca Flour, high grade, bgs	lb.	.03½	.05½	.03½	.05½	.03½	.05½
Tar Acid Oil, 15%, drs	gal.	.21	.24	.21	.24	.21	.24
25%, drs	gal.	.24½	.27½	.24½	.27½	.24	.27½
Tar, pine, delv, drs	gal.	...	.26	...	.26	.25	.26
tks, delv, E. cities	gal.	...	.20	...	.20	...	.20
Tartar Emetic, tech, bbls	lb.	.24¾	.25	.24¾	.25	.24¾	.25
USP, bbls	lb.	.30	.30½	.30	.30½	.28	.30½
Terpineol, den grd, drs	lb.	.13¾	.14¾	.13¾	.14¾	.13¾	.14¾
tks	lb.	.13	.14	.13	.14	.13	.14

t Bags 15c lower; *u* + 10; * Bbls. are 20c higher.

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Tetrachlorethane
Zinc Stearate

Prices

	Current Market		1937 Low	1937 High	1936 Low	1936 High
Tetrachlorethane, 650 lb drs	lb.	.08	.08½	.08	.08½	.08	.08½
Tetrachloroethylene, drs, tech	lb.	...	.10½	...	.10½	...	...
Tetralene, 50 gal drs, wks	lb.	.12	.13	.12	.13	.12	.13
Thiocarbanilid, 170 lb bbl	lb.	.20	.25	.20	.25	.20	.25
Tin, crystals, 500 lb bbls, wks	lb.	.40	.40½	.37½	.40½	.35	.39½
Metal, NY	lb.	...	.5485	.49⅜	.5485	.40½	.52½
Oxide, 300 lb bbls, wks	lb.	.57	.59	.55	.59	.47	.57
Tetrachloride, 100 lb drs, wks	lb.	...	.27½	.25½	.27½	.21¼	.26¾
Titanium Dioxide, 300 lb bbls	lb.	.16¼	.17	.16¼	.17	.16¼	.19¼
Barium Pigment, bbls	lb.	.06	.06¼	.06	.06¼	.05¾	.06½
Calcium Pigment, bbls	lb.	.06	.06¼	.06	.06¼	.05¾	.06½
Toluidine, mixed, 900 lb drs, wks	lb.	.26	.27	.26	.27	.27	.28
Toluol, 110 gal drs, wks	gal.	...	.35	...	.35	...	.35
8000 gal tks, frt allowed	gal.	...	.30	...	.30	...	.30
Toner Lithol, red, bbls	lb.	.75	.80	.75	.80	.75	.80
Para, red, bbls	lb.	...	.75	...	.75	...	.75
Toluidine, bgs	lb.	...	1.35	...	1.35	...	1.35
Triacetin, 50 gal drs, wks	lb.	...	.36	...	.36	.32	.36
Triamyl Borate, lcl, drs, wks	lb.	...	.27	...	.27	...	...
Triamylamine, drs, wks	lb.	...	1.25	...	1.25	...	1.25
Tributyl citrate, drs, frt all'd	lb.	...	.45	...	.45	...	...
Tributyl Phosphate, frt all'd	lb.	...	.50	...	.50	...	...
Trichlorethylene, 600 lb drs, frt allowed E. Rocky Mts	lb.	.089	.094	.089	.094	.089	.094
Tricresyl Phosphate, tech, drs	lb.	.22½	.23	.22½	.23	.19	.26
Triethanolamine, 50 gal drs wks	lb.	.26	.30	.26	.30	.26	.30
tks, wks	lb.	...	.25	...	.25	...	.25
Triethylene glycol, drs, wks	lb.	...	.26	...	...	...	...
Trimethylamine, c-l, drs, frt allowed E. Mississippi	lb.	...	1.00	...	1.00	...	...
Triphenylguanidine	lb.	.58	.60	.58	.60	.58	.60
Triphenyl Phosphate, drs	lb.	.34	.36	...	...	...	...
Tripoli, airfloated, bgs, wks	ton	25.00	30.00	25.00	30.00	27.50	30.00
Turpentine (Spirits), c-l, NY dock, bbls	gal.	...	.47	...	.47	.40½	.50
Savannah, bbls	gal.	...	.42	...	.42	.35½	.45
Jacksonville, bbls	gal.	...	.39½	.39½	.41	.35¼	.44½
Wood Steam dist, bbls, c-l, NY	gal.	...	.39	.39	.44	.38	.47
Urea, pure, 112 lb cases	lb.	.14½	.15½	.14½	.15½	.14½	.17
Fert grade, bgs, c.i.f.	ton						
c.i.f. S.A. points	ton	95.00	110.00	95.00	110.00	95.00	110.00
Dom, f.o.b., wks	ton	95.00	101.00	95.00	101.00	95.00	110.00
Urea Ammonia liq 55% NH_3, tks	unit	...	1.04	...	1.04	...	.96
Valonia beard, 42%, tannin bgs	ton		48.50	35.00	49.00	46.00	64.50
Cups, 32% tannin, bgs	ton	31.50	33.50	31.50	36.00	34.00	42.00
Vanilin, ex eugenol, 25 lb tins, 2000 lb lots	lb.	...	3.65	...	3.65	3.65	3.75
Ex-guaiacol	lb.		3.55		3.55	3.55	3.65
Vermillion, English, kgs	lb.	1.72	1.82	1.72	1.82	1.52	1.85
Wattle Bark, bgs	ton	31.00	32.00	31.00	32.00	26.50	32.00
Extract, 60°, tks, bbls	lb.	...	.03⅝	...	.03⅝	...	.03⅝
WAXES							
Wax, Bayberry, bgs	lb.	.16½	.17	.16½	.17	.16½	.20
Bees, bleached, white 500 lb slabs, cases	lb.	.38	.44	.38	.42	.34	.40
Yellow, African, bgs	lb.	.29½	.30	.28½	.30	.24	.27
Brazilian, bgs	lb.	.31	.32	.33	.33½	.25	.29½
Chilean, bgs	lb.	.31	.32	.30	.33½	.25	.29½
Refined, 500 lb slabs, cases	lb.	.34	.38	.29½	.38	.28	.32
Candelilla, bgs	lb.	.15½	.16½	.15½	.16½	.14	.17½
Carnauba, No. 1, yellow, bgs	lb.	.45	.45½	.45	.47	.43½	.48
No. 2, yellow, bgs	lb.	.43½	.44	.43½	.45	.42	.46
No. 2, N. C., bgs	lb.	.38	.40	.38	.40	.38	.40
No. 3, Chalky, bgs	lb.	.34½	.36	.34½	.36	.33½	.38
No. 3, N. C., bgs	lb.	.35	.35½	.35	.37	.34	.41
Ceresin, dom, bgs	lb.	.08½	.12	.08	.12	.08	.11
Japan, 224 lb cases	lb.	.10½	.11	.10½	.11	08	.10½
Montan, crude, bgs	lb.	.11	.12	.11	.12	.10¾	.11¾
Paraffin, see Paraffin Wax.							
Spermaceti, blocks, cases	lb.	.23	.24	.23	.24	.22	.24
Cakes, cases	lb.	.24	.25	.24	.25	.23	.25
Whiting, chalk, com, 200 lb bgs c-l, wks	ton	12.00	14.00	12.00	14.00	...	15.00
Gilders, bgs, c-l, wks	ton		15.00	...	15.00	11.50	15.00
Wood Flour, c-l, bgs	ton	20.00	30.00	18.00	30.00	18.00	30.00
Xylol, frt allowed, East 10° tks, wks	gal.	...	.33	...	.33	...	.33
Coml, tks, wks, frt all'd	gal.	...	.30	...	.30	...	.30
Xylidine, mixed crude, drs	lb.	.35	.36	.35	.36	.36	.37
Zinc, Carbonate tech, bbls, NY	lb.	no prices		no prices		.09	.11
Chloride fused, 600 lb drs, wks	lb.	.04½	.046	.04½	.046	.04½	.05¾
Gran, 500 lb drs, wks	lb.	.05	.05¾	.05	.05¾	.05	.05¾
Soln 50%, tks, wks 100	lb.	...	2.00	...	2.00	...	2.00
Cyanide, 100 lb drs	lb.	.36	.37	.36	.37	.36	.38
Zinc Dust, 500 lb bbls, c-l, delv	lb.	...	.087	.079	.087	.068	.0755
Metal, high grade slabs, c-l, NY	100 lb.	...	7.15	6.35	7.15	...	5.825
E. St. Louis	100 lb.	...	6.80	6.00	6.80	4.80	5.45
Oxide, Amer, bgs, wks	lb.	.05¼	.05½	.05¼	.05½	.05	.05½
French, 300 lb bbls, wks	lb.	.05½	.07	.05½	.07	.05½	.07
Palmitate, bbls	lb.	.23	.25	.23	.25	.22	.23
Resinate, fused, pale, bbls	lb.	...	.10	.09	.10	.05¾	.10
Stearate, 50 lb bbls	lb.	.20	.23	.20	.23	.19	.23

		Current Market		1937 Low	1937 High	1936 Low	1936 High
Zinc Sulfate, crys, 400 lb bbl, wks	lb.	.028	.033	.028	.033	.028	.033
Flake, bbls	lb.	.032	.035	.032	.035	.032	.035
Sulfide, 500 lb bbls, delv	lb.	.09¼	.09¾	.09¼	.09¾	.09¼	.11¾
bgs, delv	lb.	.09	.09½	.09	.09½	.09	.11½
Sulfocarbolate, 100 lb kgs	lb.	.24	.25	.24	.25	.24	.25
Zirconium Oxide, crude, 73-75% grd, bbls, wks	ton	75.00	100.00	...	...	...	...
kgs, wks	lb.	.04¼	.04½	...	...	...	...

Oils and Fats

Babassu, tks, futures	lb.	...	.11¼	...	.11¼	...	...
Castor, No. 3, 400 lb bbls	lb.	.10¼	.10¾	.10¼	.10¾	.10¼	.10¾
Blown, 400 lb bbls	lb.	.12¼	.13	.12¼	.13	.12¼	.13
China Wood, drs, spot NY	lb.	.15¼	.15½	.14½	.15½	.13	.19¼
Tks, spot NY	lb.	...	.144	.14¼	.144	.125	.19
Coast, tks	lb.	...	.146	.133	.146	.127	.18
Coconut, edible, bbls NY	lb.	...	.14½	.14½	.15	.09¼	.14¼
Manila, tks, NY	lb.	...	.09¼	.09¼	.09½	.04⅛	.07
Tks, Pacific Coast	lb.	...	.08⅞	.08¾	.08⅞	.03⅞	.08½
Cod, Newfoundland, 50 gal bbls	gal.	...	.51	.51	.52	.40	.48½
Copra, bgs, NY	lb.	.053	nom.	.053	.055	.0320	.0535
Corn, crude, tks, mills	lb.	...	.10	.10	.10¾	.08	.10½
Refd, 375 lb bbls, NY	lb.	...	.12¾	.12¾	.13	.10¾	.13
Cottonseed, see Oils and Fats News Section.							
Degras, American, 50 gal bbls. NY	lb.	.07¾	.08	.07¾	.08	.05¼	.08
English, bbls, NY	lb.	.07¾	.08	.07¾	.08	.04	.08
Greases, Yellow	lb.	.08½	.08⅝	.08½	.08⅞	.03⅜	.08¼
White, choice bbls, NY	lb.	.08⅞	.09⅞	.08⅞	.09⅞	.04⅛	.08¾
Herring, Coast, tks	gal.	...	nom.	...	nom.	...	.31
Lard Oil, edible, prime	lb.	...	.16¼	.16¼	.16¾	.12¾	.16¼
Extra, bbls	lb.	...	.13½	...	.13½	.09½	.13
Extra, No. 1, bbls	lb.	...	.13¼	.13	.13¼	.07¾	.12¼
Linseed, Raw less than 5 bbl lots	lb.	.107	.109	.107	.111	.104	.117
bbls, c-l, spot	lb.	.099	.101	.099	.103	.096	.103
Tks	lb.	.093	.095	.093	.097	.086	.097
Menhaden, tks, Baltimore	gal.	.40	.43	.37	.43	.25	.36
Refined, alkali, drs	lb.	...	.094	.09	.094	.066	.084
Tks	lb.	...	.088	.084	.088	.062	.078
Kettle bodied, drs	lb.	...	.104	.10	.104	.08	.096
Light pressed, drs	lb.	...	.088	.084	.088	.06	.078
Tks	lb.	...	.082	.078	.078	.056	.072
Neatsfoot, CT, 20°, bbls, NY	lb.	...	.17¾	.17½	.17¾	.16	.17
Extra, bbls, NY	lb.	...	.13½	.13¼	.13½	.08	.12½
Pure, bbls, NY	lb.	...	.14¼	...	.14¼	.11½	.12¾
Oiticica, bbls	lb.	.11¾	.12	.11½	.12	.10	.15½
Oleo, No. 1, bbls, NY	lb.	...	.13⅝	.13⅜	.14½	.09¼	.14
No. 2, bbls, NY	lb.	...	.13⅛	.13⅛	.14	.08¾	.13½
Olive, denat, bbls, NY	gal.	...	1.65	...	1.65	.73	1.60
Edible, bbls, NY	gal.	2.50	nom.	2.20	2.50	1.60	2.25
Foots, bbls, NY	lb.	...	.12½	.11½	.12½	.08	.10⅜
Palm, Kernel, bulk	lb.	.073	nom.	.073	.08⅛	.04¾	.083
Niger, cks	lb.	.06¾	nom.	.06¾	.07¼	.04	.06½
Sumatra, tks	lb.	.05¾	nom.	.05¾	.06½	.03¾	.06½
Peanut, crude, bbls, NY	lb.	.10¼	nom.	.10¼	.10⅝	.08	.10½
Tks, f.o.b. mill	lb.	.10⅛	nom.	.10⅛	.10¼	.17¾	.10⅜
Refined, bbls, NY	lb.	...	.13½	...	.13½	.12	.13¼
Perilla, drs, NY	lb.	.11½	.11¾	.11½	.11¾	.07	.11¾
Tks, Coast	lb.	.11	.11¼	.11	.11¼	.066	.11¼
Pine, see Pine Oil, Chemical Section.							
Rapeseed, blown, bbls, NY	lb.	.13¼	.13½	.13¼	.13½	.086	.13½
Denatured, drs, NY	gal.	.85	.86	.85	.86	.52	.85
Red, Distilled, bbls	lb.	.11⅝	.12⅝	.11⅝	.12⅝	.08⅝	.11⅝
Tks	lb.	...	.10¾	...	.10¾	.07¾	.09¼
Salmon, Coast, 8000 gal tks	gal.	...	nom.	...	nom.	.31	.32½
Sardine, Pac Coast, tks	gal.	.52	.55	.50	.55	.28	.47
Refined alkali, drs	lb.	...	.094	.09	.094	.066	.084
Tks	lb.	...	.088	.084	.088	.062	.078
Light pressed, drs	lb.	...	.088	.084	.088	.06	.078
Tks	lb.	...	.082	.078	.082	.056	.072
Sesame, yellow, dom	lb.	...	.13¼	...	.13¼	.12¾	.14½
White, dos	lb.	...	.13¼	...	.13¼	.12¾	.14½
Soy Bean, crude							
Dom, tks, f.o.b. mills	lb.	...	.10½	...	.10½	.07	.10½
Crude, drs, NY	lb.	...	.11½	...	.11½	.076	.11½
Ref'd, drs, NY	lb.	.12	.12½	.12	.12½	.081	.12½
Tks	lb.	...	.11½	...	.11½	.07½	.11½
Sperm, 38° CT, bleached, bbls NY	lb.	.10	.102	.10	.102	.094	.102
45° CT, bleached, bbls, NY	lb.	.093	.095	.093	.095	.087	.095
Stearic Acid, double pressed dist bgs	lb.	.12½	.13½	.12½	.13½	.08½	.12½
Double pressed saponified bgs	lb.	.12¾	.13¾	.12¾	.13¾	.09	.12¾
Triple pressed dist bgs	lb.	.15½	.16½	.15½	.16½	.11¼	.15½
Stearine, Oleo, bbls	lb.	.10¼	.10½	.10¼	.11½	.07¼	.12¼
Tallow City, extra loose	lb.	.08¾	.09	.08¾	.09⅛	.04⅛	.08⅜
Edible, tierces	lb.	...	.10¼	...	.10¼	.06¾	.09½
Acidless, tks, NY	lb.	...	.13	.12¾	.12¾	.07	.11¾
Turkey Red, single, bbls	lb.	.08	.08½	.08	.08½	.08	.08½
Double, bbls	lb.	.12½	.13	.12½	.13	.12½	.13½
Whale: Winter bleach, bbls, NY	lb.	.105	.107	.091	.107	.072	.087
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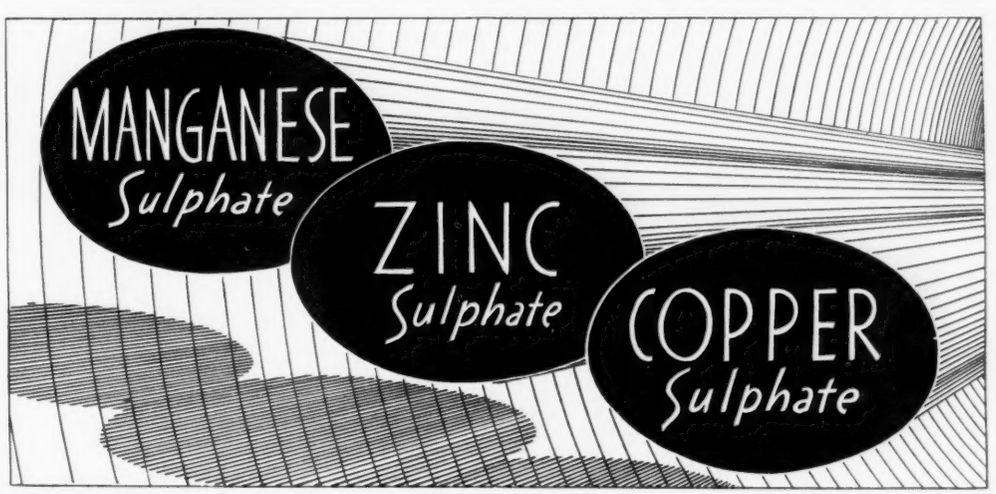

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GDC

"We"—Editorially Speaking

Speaking of taxation without representation, as we were last month, we wonder during all the activities of the Honorable Madam Secretary of Labor during our strike epidemic, why there are no conferences and protests and proposed legislation from the Honorable Secretary of Commerce.

❖❖❖❖

A Japanese maker of permanganate announces the production of saccharin; a British producer of saccharin has begun manufacture of permanganate. Sauce for the goose, it seems, is oxidizing agent for the gander.

❖❖❖❖

U. S. bonds mean deferred U. S. taxes.

❖❖❖❖

After an exhaustive, comparative analysis of the balance sheets of representative British industrial corporations to determine how they have been financing the increasing demands of recovery, the esteemed *Economist* painstakingly discovers that the majority have done so, not by borrowing, not by selling securities; but out of accumulated surplus. Their conclusion is that British corporation managers and their shareholders may be thankful indeed that they do not have to pay such an Undivided Profits Tax as we now have in the United States.

❖❖❖❖

Don't we all like a back-handed compliment like that—when it slaps the other fellow's cheek. But after all, isn't this the strongest argument against that tax?

❖❖❖❖

It has been said that the Undivided Profits Tax was levied to encourage spending. Spending by whom and for what? By the Government chiefly for boondoggles, for we guess that most consumers who get an extra dividend via this tax route are still shy enough to hide it away in the old sock. Contrariwise this tax discourages spending for growth and expansion, for new plants and equipment, the spending which puts money to work, where it will do the most good. Lack of that kind of spending has kept the so-called heavy industries down and out.

❖❖❖❖

Several years ago the Charlotte (N.C.) *Observer* proposed Charles H. Herty for president. A scientifically trained mind with a strong bend towards research—not experiment—makes a strong appeal, and we take our stand as the original "Midgley for President" journal. To press as his claim we point out that "tetraethyl lead in motor fuel adds fifty times as much horsepower annually to American civilization as all that will be generated at Boulder Dam."

❖❖❖❖

Did you know that apples are a raw material of the munitions industry? Neither did we. But it seems that Belgian buyers have virtually cornered the English market for Newton Pippins. They gave it out that these apples were to be re-exported to Germany for the manufacture of apple butter. Some unknown chemist has set the British newspapers all in a dither, reporting that this particular variety of apple is extremely rich in malic acid, a priceless ingredient in a new poison gas. Which report is, of course, basically incorrect, for the primary product is not apple butter. It is applesauce.

❖❖❖❖

Cordially we second the protest of Charlie Brand against misleading stories carried by newspapers about the triple superphosphate produced by the T.V.A. This material has been widely hailed as a "new electrochemical made possible only through quantities of cheap electric power" and that "there isn't a pinch of triple superphosphate for sale." As a matter of fact this material has been made for 25 years. It is now produced by six different companies at six locations by four different methods, none of them electrical. The price on the open market will be found quoted on page 329 of this issue.

❖❖❖❖

Semi-officially responsibility for these statements has been denied by the T.V.A.; but the time-worn official formula is "Now, boys, you can't quote me on this, but—"

❖❖❖❖

How about a yardstick on government publicity? It cost us taxpayers 20 million dollars last year. That would buy a tidy lot of kilowatt hours of anybody's electricity.

❖❖❖❖

Which reminds us that the British taxpayers, through their representatives in Parliament, have been asking some very pointed and apparently embarrassing questions of the Government regarding their investment in the Billingham hydrogenation plant.

Captain Crookshank, for the Government, admitted that in the first full year's operation (1936) 112,000 tons of motor spirit had been produced, with a coal consumption of 100,000 tons hydrogenated, and 325,000 tons used for making steam, hydrogen and operating the process. Three and a quarter to one odds are too much for the conservative Britisher.

❖❖❖❖

Greetings and salutations to the *Potash Journal*—a very pretty baby among the house organs.

Fifteen Years Ago

From our issues of March, 1922

Dr. Charles H. Herty, S. O. C. M. A. president, and J. I. Tierney, M. C. A. secretary, oppose revival of patent convention.

H. B. Prior resigns from Grasselli Chemical to open office in National City Bldg., N. Y. C., as dealer in industrial chemicals.

A. E. Staley Mfg. Co., Decatur, Ill., announces opening of branch sales offices in Boston, New York, and Spartanburg, S. C.

Du Pont reports net sales of $55,285,181 for year 1921, against $93,983,292 in 1920.

Dr. Ellwood Hendrick, former president Chemists' Club, addresses National Arts Club on the subject "Out of Chemistry and in Again."

Freeport-Texas Co. negotiates $4,000,000 deal.

Grasselli Chemical files articles of incorporation at San Francisco.

Allied Chemical stock touches 65.

National Aniline & Chemical starts production of medicinal agents and biologic dyes; also acquires services of Dr. Lewis H. Marks to supervise new department.

Red prussiate of potash is practically unobtainable at 50c per pound.

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If you are interested in further information concerning this unusual chemical, we shall be glad to send you a sample and complete technical data.

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Flash Point: 25.6° C. (78° F.).

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Odor: Mild, ethereal.

Melting Point: —59° C.

Refractive Index: 1.4458 at 20° C.

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Surface Tension: 28.3 dynes per cm. at 24° C.

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